July 1983 Volume 2 $2.00

softalk

for the IBM Personal Computer

MICROS IN MEDICINE

THE EVOLUTION OF MODULA-2

NETWORKING BASICS

EXEC AMDEK

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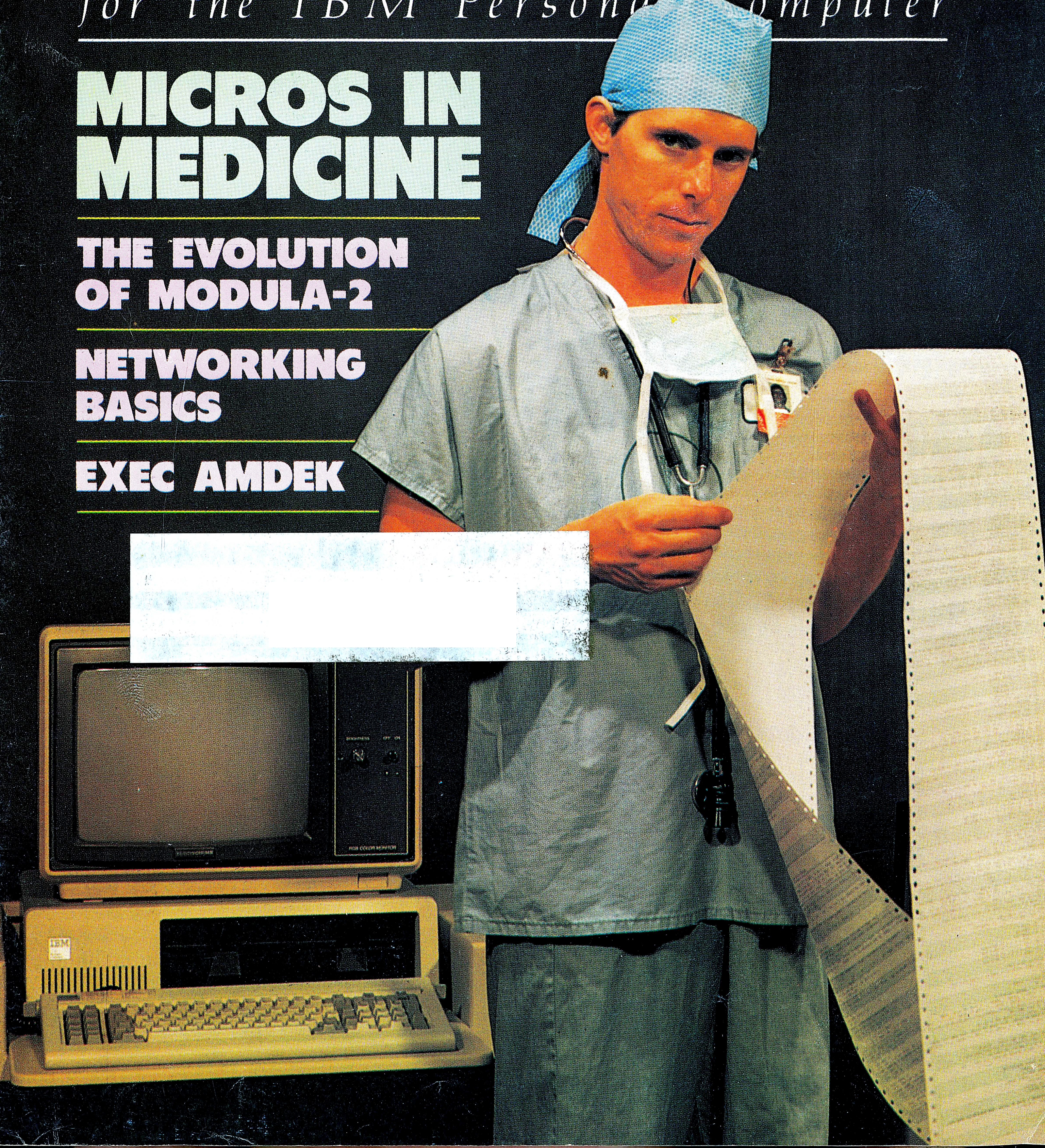

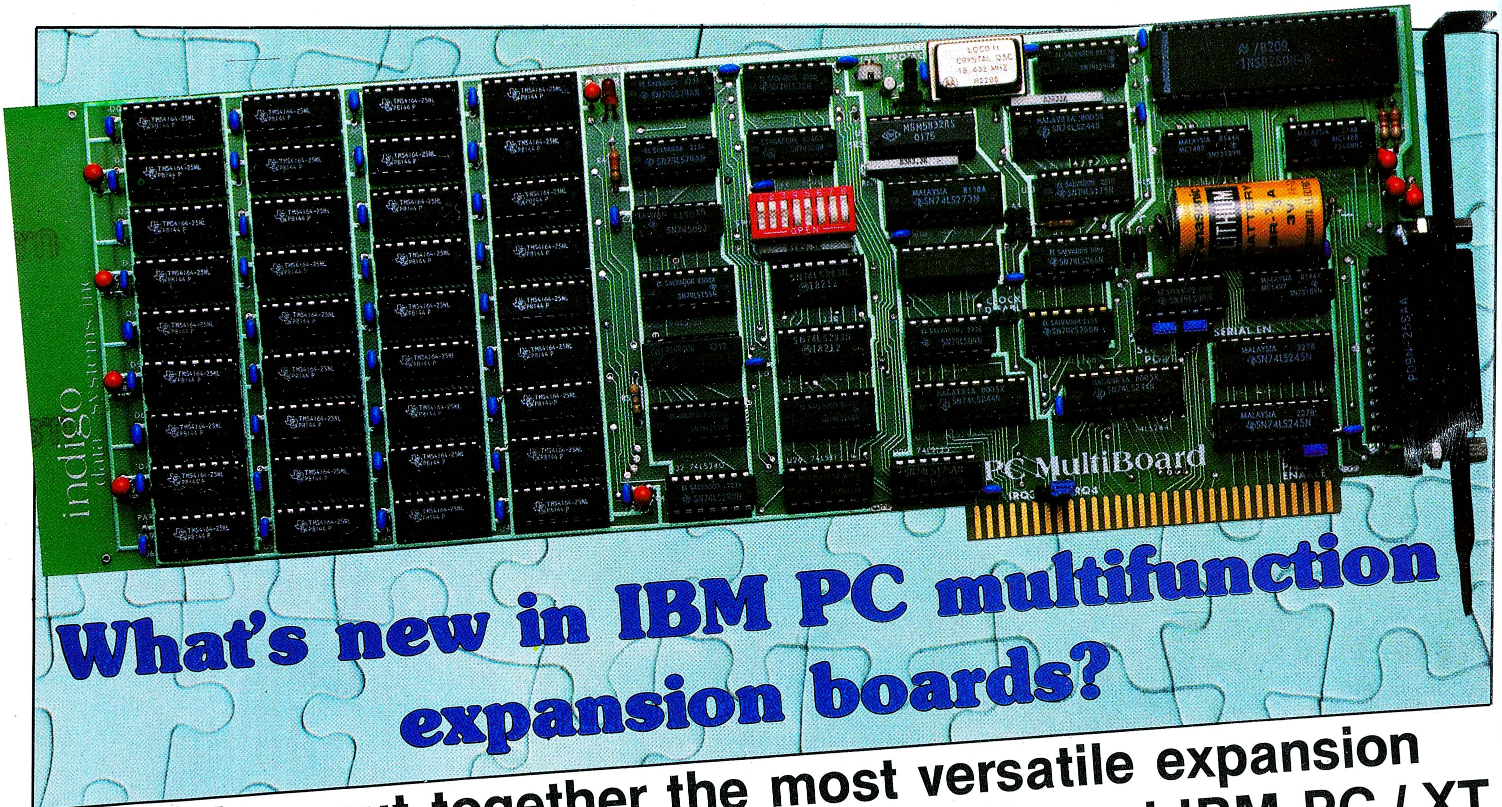

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for the IBM Personal Computer

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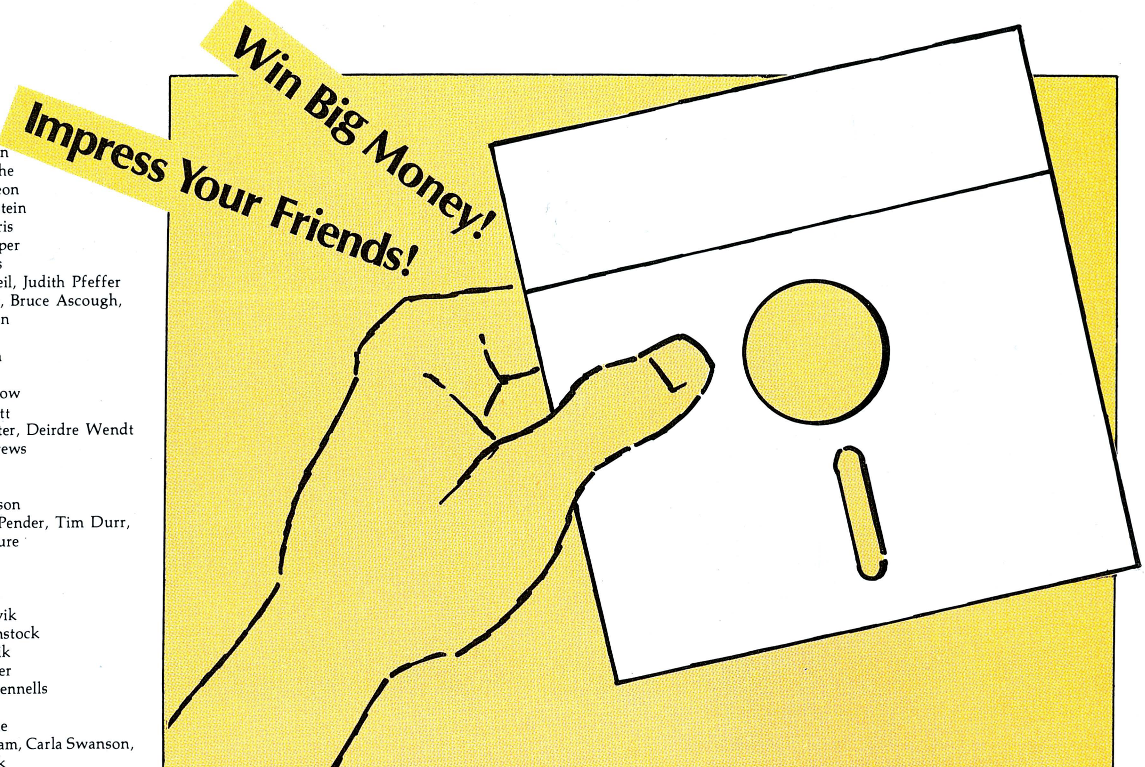
Win Big Money!
Impress Your Friends!

DESIGN THIS PACKAGE

"No calc is the best calc." That's the motto of a firm that makes *InvisiCalc*, the software novelty that doesn't ask "what if?," but "who cares?" *InvisiCalc* comes in a plain white envelope. Apparently the artwork vanished along with the floppy part of the disk.

This no-show spreadsheet has inspired our July contest. Dream up a software product—game, utility, spreadsheet, graphics, whatever—then design the package it comes in.

There are two categories: original art (pencil, paint, collage, and so on), and computer-generated art (plotter, light pen, and graphics software stuff). Please submit your entry for either category on a reasonably sized piece of paper, in the most finished form you can. Jumbo airbrush deluxe concoctions on megafine art boards are not necessary to win.

The contest will be judged on cleverness of product invented (the funny bone sits in on this one), appropriateness of graphics in relation to concept (does it have punch?), and overall quality of execution.

If your art skills are weak, what's to stop you from teaming up a killer idea with some borrowed talent? We won't tell, just as long as your entry has what it takes to win.

One winner in each category will be chosen. Each will receive one hundred dollars' worth of goodies from his local dealer. In the event of a dearth of decent entries (no more limericks, please!), only one winner will be chosen. If we get more than two pieces of great art, we'll display a few runners-up as well as the winners.

Send your art to Draw Me, Softalk/IBM, Box 60, 11160 McCormick Street, North Hollywood, CA 91603. Please include your name, address, city, state, zip, and phone number with each entry.

Postmark deadline is August 15. P.S.: No need to waste your money sending things express or registered mail; regular mail gets here quite regularly.

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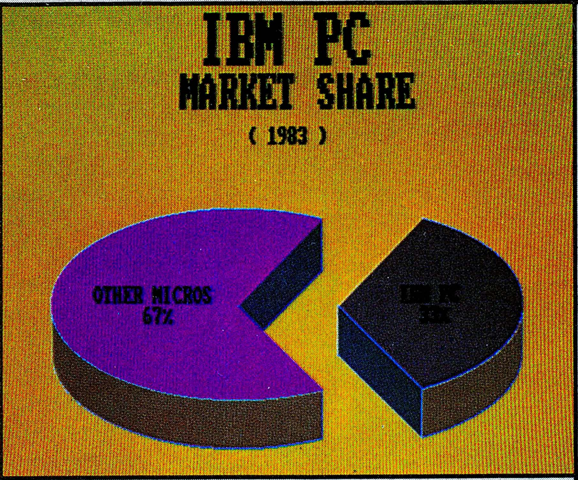
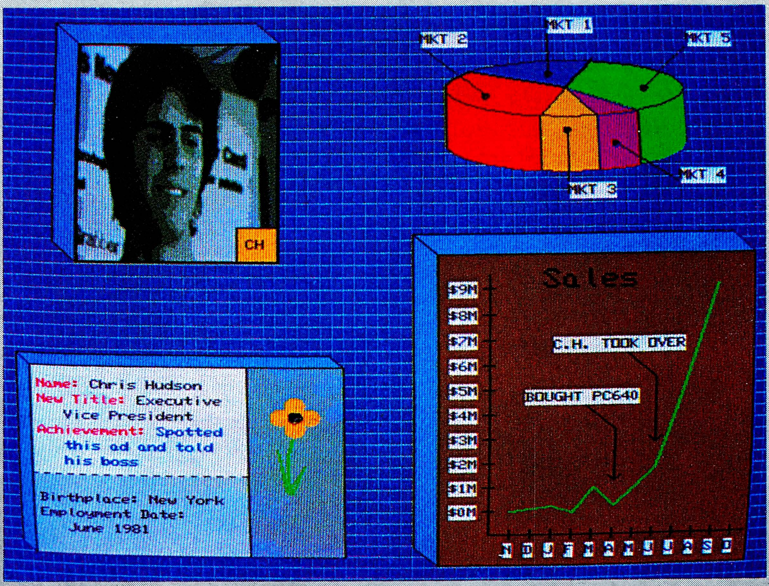
Now there's a 640 x 480 Professional Color Graphics Board for the IBM PC...

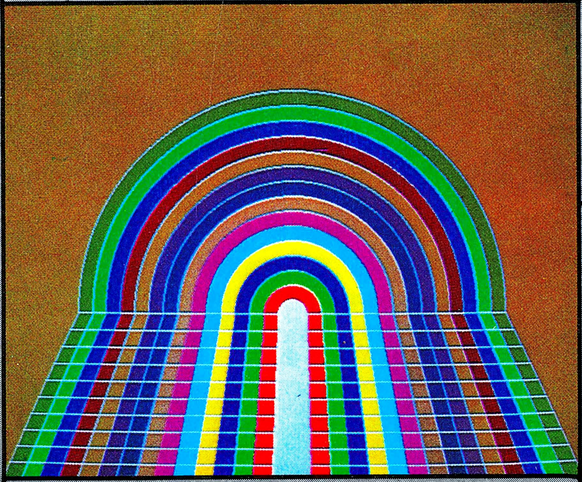


Unretouched photos shot from 13" screen with Canon AE-1 SLR at f5.6, 1 sec. using Kodachrome 25 film



Name: Chris Hudson
New Title: Executive Vice President
Achievement: Spotted this ad and told his boss

Birthplace: New York
Employment Date: June 1981



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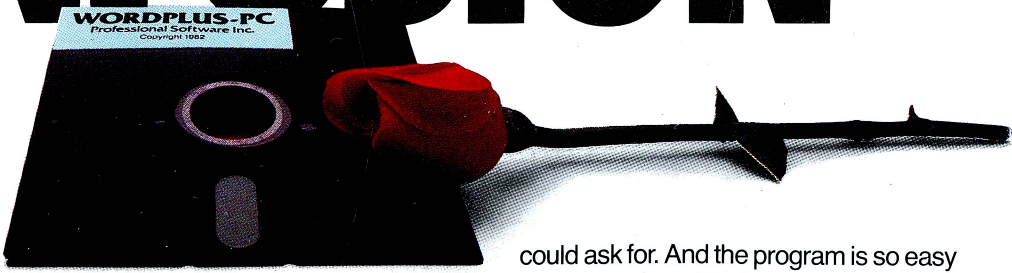

It's one confusing business, choosing a word processor. All those companies assuring you theirs is the most fantastic one of all. And leaving you to cut through all the smoke and hopefully whittle them down to the best one for you.

Well, we can help. If you'll just invest the next three minutes reading this, we'll tell you about a word processor that makes picking the right one a real breeze.

FIRST, A WARNING. There are two things you must do when evaluating any word processor. First, be careful. It's no secret that many of today's claims about being easy to learn and use just don't stand up to careful comparison. Watch carefully for complicated codes and programs that require "training sessions." Secondly, be selective. Buy a word processor you can use on a daily basis, not one that requires another "training session" when someone goes on vacation. In other words, be very careful to select the word processor that's absolutely the best and easiest to use. Which is what we'll now introduce you to.

WHY ONE WORD PROCESSOR MAKES THE MOST SENSE OF THEM ALL. Meet WordPlus-PC. It's the advanced, "user-oriented" software package that turns your IBM-PC computer into a word processor equipped with the sophisticated capabilities of far larger, more expensive systems.

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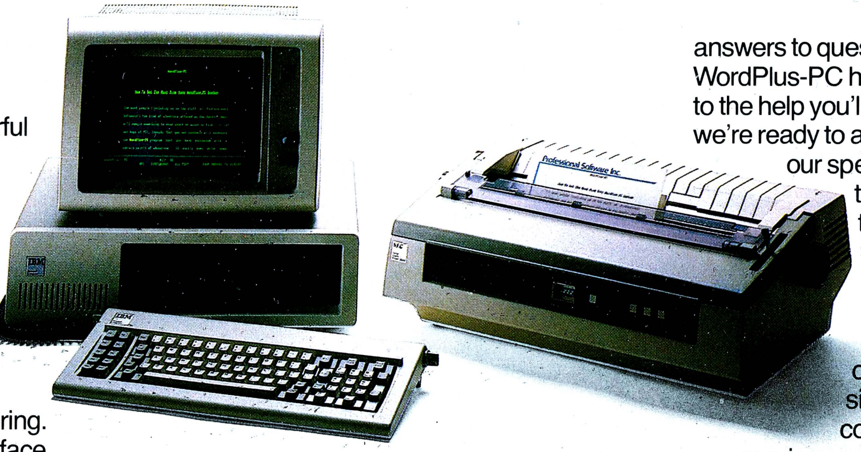

ALL THE FEATURES YOU'D EXPECT.

WordPlus-PC is both powerful and versatile. Its long list of major functions includes movement of paragraphs, global search-and-replace, and creation of multiple "boilerplate" and personal letters with the touch of a few buttons. There are 3-line headers and footers and automatic page numbering. When you underline or boldface words as you type, WordPlus-PC displays them in that form on the screen. You can merge information created by popular spread sheet programs. You'll create personal letters quickly and easily, or merge name and address information from other programs. You can easily create standard layouts for preprinted forms and use WordPlus-PC to prepare invoices or quotations. For large corporate customers, WordPlus-PC has the capability to merge information from files created by the firm's mini or mainframe computer. You can even type new documents while the system is printing other ones. And you'll find WordPlus fully compatible with virtually all popular ASCII letter-quality and dot matrix printers.

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crosstalk

A Solution to Scrollk.com vs. Prokey

Your article in the May issue by John Socha titled "The Scroll Lock Mystery" was very good. I punched in the Basic program and it worked very well. It is truly a nice utility.

There is, however, one very major problem for me and I gather a lot of other pc users in the crowd. Scrollk.com interferes with the really fabulous utility—Prokey, by RoseSoft. I'm sure most people know the power of this keyboard utility and I am sure those who do cannot live without it once they have gotten used to it, as I have.

The problem is that after running Scrollk.com, Prokey continues to function until you actually access the main file, Prokey.exe. This is necessary when one wants to change Prokey files, clear Prokey, and quit or enter Prokey. When that file is accessed, the computer locks up in the middle of disk drive access. Not even the warm boot is possible.

This leaves me and many others with a choice of a utility that really should be a part of DOS and one that is a part of every program I own. If you're wondering, the answer has to be Prokey.

We look to you and/or John Socha for help. His program is too good to leave lying on the disk. There must be some way to undo Scrollk.com so that Prokey.exe can be accessed. Once the Prokey command is accomplished, Scrollk.com can then be called back in to work its wonders. Please send me the little program that will undo Scrollk.com or that will fix it so it will not interfere with Prokey. Hopefully you or John himself can solve this problem.

If an answer is found, I imagine it should be published for all those that did not have time to write about the "bug."

I guess we pcers have just gotten used to having our cake and eating it too.

K. D. Bremer, Austin, TX

RoseSoft has made a change to Prokey that makes Prokey work together with Scrollk.com. We're making the revision available to any registered Prokey owner for $5. Just write us a letter and send a check or call us. Ask for version 2.20. Version 2.20 has some other new features that any Prokey user will be interested in.

David Rose
RoseSoft

Scrollk.com Kudos

May has been a very good month for me and my pc. John Socha's "The Scroll Lock Mystery" has to rank with the best of all technical articles for pc buffs. To be able to patch DOS to allow for scrolling control and then begin to understand what is actually taking place is a really great experience. Thanks, John.

As to the Exec story on AST, I would add only a customer's note of appreciation for AST's excellent service. Its newly added expansion board features providing for printer spooling and electronic disk emulation were offered free to purchasers of older boards; one had only to send in a formatted disk. If you like the speed of *WordStar* and *SuperCalc* on the pc, wait till you try them using an electronic disk.

You might want to write a story on the use of Sony Profeel monitors with the IBM pc. I have a nineteen-inch SK-1901 and, since a friend of mine designed and my son built the interface "black box" and cable, I've been very pleased with the clarity of both the RGB and composite pictures. I am still not able to get more than eight colors in RGB mode (I have seen a twelve-inch deliver all sixteen). Fortunately, however, a Sony representative, at its NCC show booth in Anaheim, California, the week of May 16, indicated that the company has developed a solution to the problem for the original nineteen-inch and twenty-five-inch monitors and will get back to me when the show is over. Apparently the deliveries in the future will have the necessary modification in place, and IBM has just come out with a cable that works with the twelve-inch Sony Profeel.

Ken Hunt, Hacienda Heights, CA

The article by John Socha, "The Scroll Lock Mystery," in the May issue contains much helpful information on the uses of the byte at 417H, but it also contains a subtle error. Socha writes that bit 7 is set when the insert state is active. Actually bit 7 is set when the insert key is pressed; it's cleared the next time this key is pressed. This causes no problems in cases where insert mode is turned on and off by pressing the insert key, but this is not the case in Basic. In Basic, the insert mode can be turned off by moving the cursor or pressing the enter key—this does not affect bit 6. It is important to be aware of this when working on Basic programs that read byte 417H. If one is alternately running and editing such a program, it cannot be assumed that bit 6 is clear when the program begins. The best way to avoid trouble is to initialize the byte in programs that use it. This can be done with the following sequence:

```
DEF SEG=0:POKE &H417,0.
```

Harold Brown, DeKalb, IL

Held Accountable

In December you published my letter in which I indicated some problems with BPI's General Accounting package. In February you published a reply from Bob Orr, BPI's sales manager. He invited anyone with problems to contact him. I did, and he was very helpful and enabled me to iron out the problem that I either had or thought I had. I wish I had been put in touch with him when I originally called BPI. It would have saved me a lot of time and trouble.

My statement about Basic lines longer than 254 characters got turned around. My letter said, "They work." It was turned into "They don't work." The main implication was that I don't know of any method (published by IBM) to generate Basic lines greater than 254 characters. Does anyone else know?

Your articles on Pascal extensions are excellent. I wish they had come along in your first few issues. I suppose that you have already heard enough about the three typos in figure 3 on page 117!

How about some articles on how to build your own copy-protection scheme? Perhaps the title should be "How the Floppy Disk Controller Works and Some Advanced Projects with It."

I have just recently received a copy of Leo J. Scanlon's new book, *IBM PC Assembly Language*. It is subtitled, *A Guide for Programmers*. I simply fail to understand why it has received such good reviews (in a number of places). He admits to ducking RECORD and STRUC as being too complicated and rarely used (page 72). He also ducks other important things (such as label pseudo-op, PTR attribute, and so on). My own conclusion is that the subtitle ought to be *A Beginner's Guide to Assembler Language on the IBM PC*. A serious programmer will probably learn little or nothing from this book. I haven't and am hoping I can send the book back.

Thomas B. Reifsnyder, Orange, CT

New User Group—Iowa

I noticed in your May issue of *Softalk for the IBM Personal Computer* that you listed two user groups for the IBM computer in Iowa. A third group exists and is located in Cedar Rapids-Iowa City, Iowa. Please add this user group to any future updates or to any information you are sending to user groups. The address is Hawkeye-PC, 385 Collins

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Road N.E., Suite 201, Cedar Rapids, IA 52402 (company president Ben Blackstock: 319-393-5416).

Hawkeye-PC publishes a monthly newsletter. The editor of the newsletter is Brad Hanson, 3685 Eastwood Court, Bettendorf, IA 52722. Hawkeye-PC operates a twenty-four-hour bulletin board in Cedar Rapids. The bulletin board can be accessed by calling (319) 363-3314. It supports downloading, uploading, and the exchange of messages. It currently operates at 300 baud but will soon be operating at 1200 baud as well. Meetings are held monthly and alternate between Cedar Rapids and Iowa City. More information can be obtained by contacting Ben Blackstock.

User groups are a valuable resource and I hope this information proves useful to Iowa readers.

Benjamin W. Blackstock,
Cedar Rapids, IA

User Group Number Change

In the May issue you published my name and work phone number as a source of information concerning the IBM pc and user groups. I am willing and able to help. However, I work a regular day for the United States Navy, and the number of calls I receive at work is inappropriate and disruptive to my organization.

In most of the announcements I've seen, I am associated with a user group named IBMicro, the original name of Capital PC User Group, which I founded. I am now using the name IBMicro Applications in my pc-related business ventures.

For the purposes of correcting my situation at work and continuing my availability to help people with the pc, I am providing the following:

Capital User Group
Box 3189
Gaithersburg, MD 20878
Information: contact Jan Withro (703) 978-1530

IBM PC Special Interest Group (CompuServe)
4910 Forty-third Street N.W.
Washington, DC 20016
Information: contact Mike Todd (202) 364-2467
On the CompuServe, contact Mike Todd, 70001,1264 or Wes Meier, 70215,1017

For personal assistance and information contact:
Mike Todd (202) 364-2467
4910 Forty-third Street N.W.
Washington, DC 20016

You may use this information for any purpose. Please do not publish my old work number. Thank you!

Mike Todd, Washington, DC

B-1 Bombed

I am rarely moved to write a letter in response to a magazine article; however, you have provoked me. As a new IBM pc owner I purchased the April 1983 *Softalk*, feeling pleased that I had found another periodical dedicated to the pc user. My pleasure turned to dismay as I read David Hunter's "Aerocomputing—Boeing Gets Personal."

That Boeing uses some pcs is hardly exciting news, but that you should take as your cover story an article devoid of useful information is simply incredible. I was further dismayed to find Hunter referring to a war plane, the B-1B bomber, as a "sleek, sexy plane . . .".

If this is the best cover story you could develop, it is little wonder you give *Softalk* away to pc owners; few would subscribe.

Greg Petroski, Saint Louis, MO

Beyond Basic

Thank you; Dara Pearlman's article on Pascal extensions has been a real help. I have been writing programs regularly in IBM's Pascal for courses I have been taking, but

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I've never had the time to unscramble the extensions. Microsoft must have hired the person that wrote the documentation for IBM's Job Control language—both are equally clear. The pc and the Pascal language for it are beautiful products, but the documentation is not always their equal. Even if they were, it is always helpful to read a second description.

It is refreshing to read a magazine on the pc that has articles beyond basic Basic. I have found your regular sections, such as The Right To Assemble, System Notebook, Marketalk News, and Boards and Buses, very helpful and hope Pascal Extended will become a regular.

Your magazine is read immediately upon arrival but not from cover to cover (I skip the articles on Basic). I have not written anything in Basic for over a year and hope I never have to write or read anything written in Basic longer than twenty lines.

James O. Olson, West Lafayette, IN

See Basrun

I would like to point out a peculiarity of IBM-compiled Basic, in case some users are not already aware of it. The problem occurs in programs using the Basrun run-time module with chaining. The symptom is a "String Space Corrupt" error when the chained-to overlay begins execution, and the source of the problem appears to be related to the function key definitions.

Figure 1 shows a simple test program consisting of two overlays, Test1 and Test2. In this case, the error occurs when control passes from the second overlay back to the first one. By adding a simple comment to each overlay, as in figure 2, the error can be encountered when the second overlay is invoked. Figure 3 shows that when the *key* statements are removed, the program chains correctly. Although it may not be clear from these examples that the function key definition is truly the source of the problem, I've also found that in a much larger program the same problem was eliminated by removing the *key* statements.

It appears that it is the *key* statement in the chained-to overlay that causes the problem. However, it is not sufficient to define the function keys only in an initialization overlay, since their values can be destroyed by the chaining operation. This was found to be the case in larger programs. The solution is to not use *key* but rather to check for the extended ASCII code returned by the function keys.

George Bohannon, Redondo Beach, CA

```
TYPE TEST1.BAS
10  PRINT "         TEST1"
20  PRINT
30  KEY 1, "ABCD"
40  INPUT"Hit return to begin
    chain...",REPLY$
50  CHAIN "test2.exe"

B>TYPE TEST2.BAS
10  PRINT "         TEST2"
20  PRINT
30  KEY 1, "ABCD"
40  INPUT"Hit return to continue
    chain...",REPLY$
50  CHAIN "test1.exe"

B>TEST1

B>
    TEST1
Hit return to begin chain...
    TEST2

Hit return to continue chain...
    TEST1

Internal Error - String Space Corrupt

B>
```

Figure 1.

```
type test1.basTYPE TEST1.BAS
10  PRINT "         TEST1"
20  PRINT "Test of compiled Basic
    chaining.
30  PRINT
40  KEY 1,"ABCD"
50  INPUT"Hit return to begin
    chain...",REPLY$
60  CHAIN "test2.exe"

B>TYPE TEST2.BAS
10  PRINT "         TEST2"
20  PRINT "Test of complied Basic
    chaining.
30  PRINT
40  KEY 1,"ABCD"
50  INPUT"Hit return to continue
    chain...",REPLY$
60  CHAIN "test1.exe"

    TEST1
Test of compiled Basic chaining.

Hit return to begin chain...
    TEST2
Test of compiled Basic chaining.

Internal Error - String Space Corrupt

B>
```

Figure 2.

```
TYPE TEST1.BAS
10  PRINT "         TEST1"
20  PRINT "Test of compiled Basic
    chaining.
30  PRINT
40  INPUT"Hit return to begin
    chain...",REPLY$
50  CHAIN "test2.exe"
```

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```
B>TYPE TEST2.BAS
10  PRINT "         TEST2"
20  PRINT "Test of compiled Basic
    chaining.
30  PRINT
40  INPUT"Hit return to continue
    chain...",REPLY$
50  CHAIN "test1.exe"



          TEST1
Test of compiled Basic chaining.


Hit return to begin chain...
          TEST2
Test of compiled Basic chaining.

Hit return to continue chain...
          TEST1
Test of compiled Basic chaining.


Hit return to begin chain...

          TEST2
Test of compiled Basic chaining.

Hit return to continue chain...
*Break*

B>
```

Figure 3.

Pascal Correction

I wish to compliment you on your May issue. I do, however, wish to point out a couple of typographical errors that would be difficult to catch for novices with the Pascal language.

On page 117 you present a listing of a program that has been set in type rather than reproduced directly from a computer printout (usually a bad policy). In the course of the translation two minus signs were transformed into equals signs; the obvious result is that the program will not compile as printed. In the first instance, the line appears correctly in the text of the article, but the other is again reproduced in its incorrect form on page 118.

To those who may have experienced difficulty, I offer the following corrections: Left-hand column, page 117, near the bottom, should read:

```
type
crt_buffer = array[0..crt_buffer_size
 - 1] of char;
```

Right-hand column, page 117, two-thirds of the way down, should read:

```
movesl (screen, ads screen∧[2],
crt_buffer_size - 2);
```

I hope this clears up the difficulty that some of your readers may have had.

Harry W. Kroeger, Jr., Lawrence, KS

A Lone-Star Offer

Increasing numbers of letters to Crosstalk recently have been written by scientific professionals with highly specialized software needs. Many of them are probably writing their own programs and subroutines. To avoid unnecessary duplication of effort, I would like to encourage authors to share such programs.

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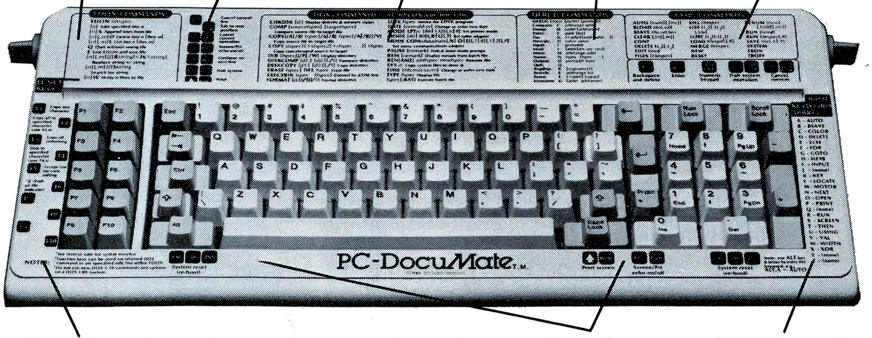

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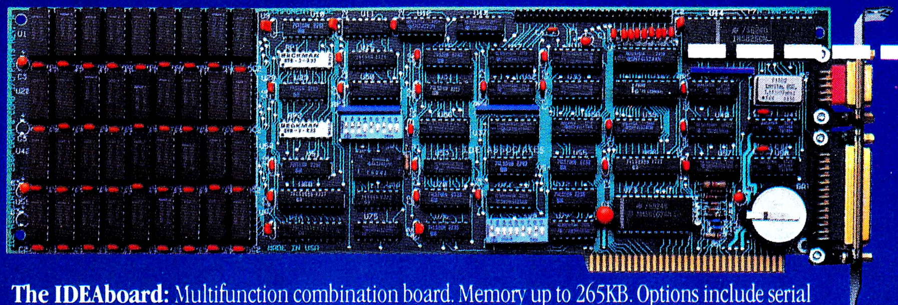

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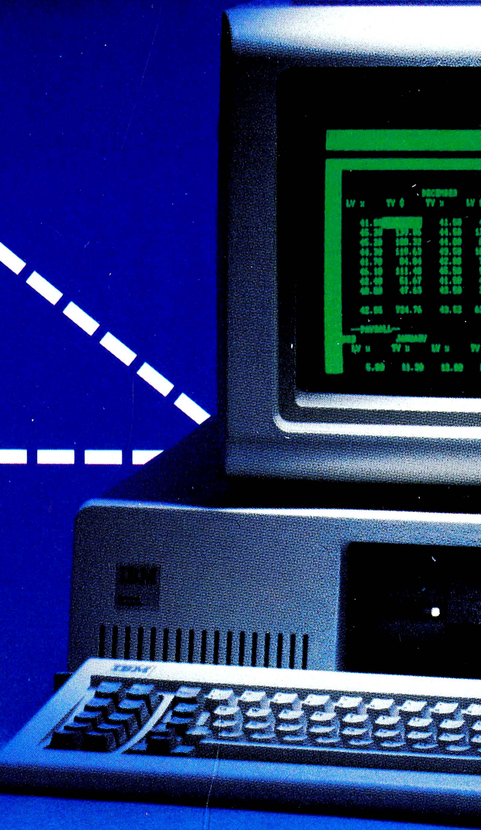

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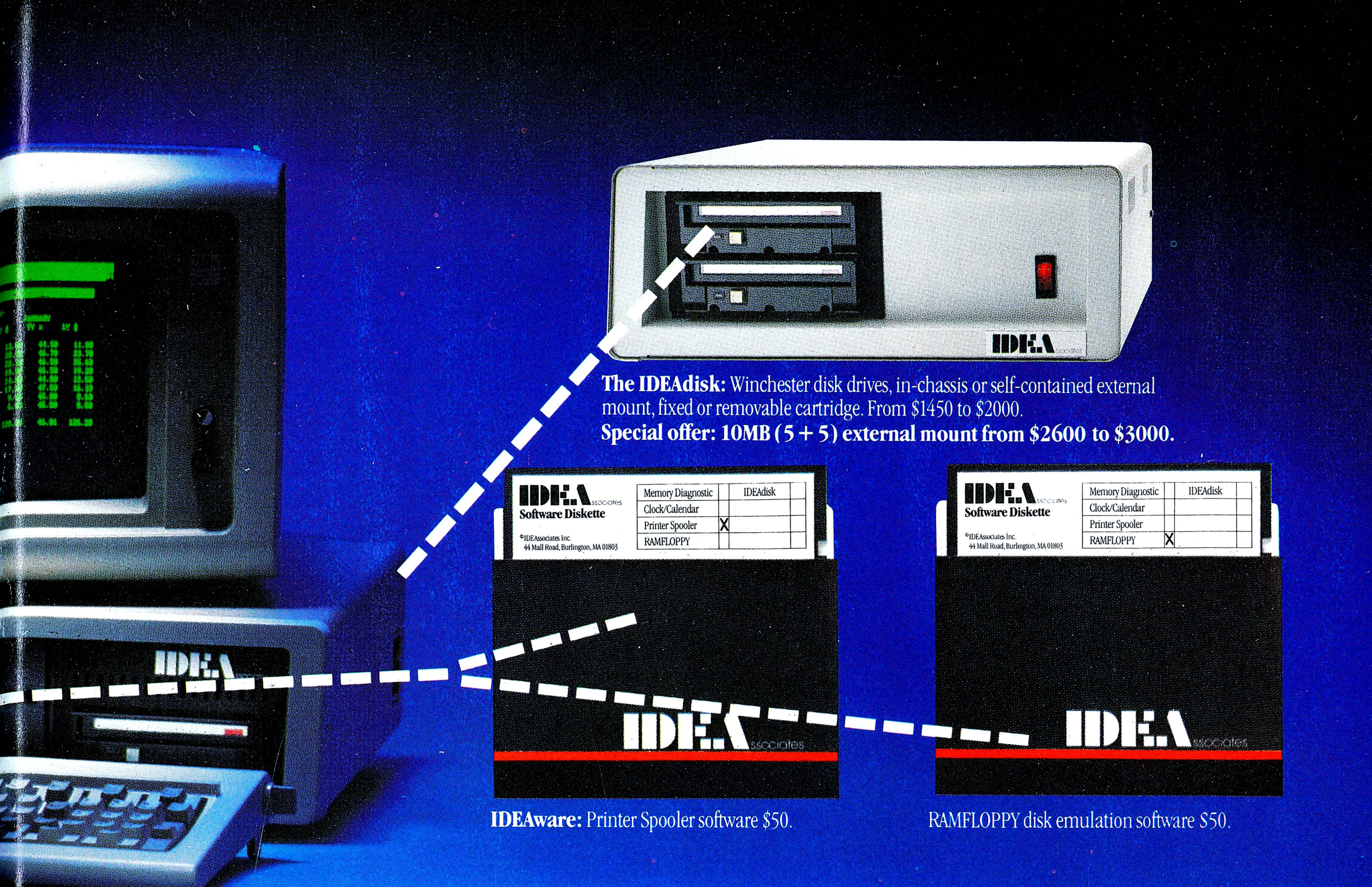

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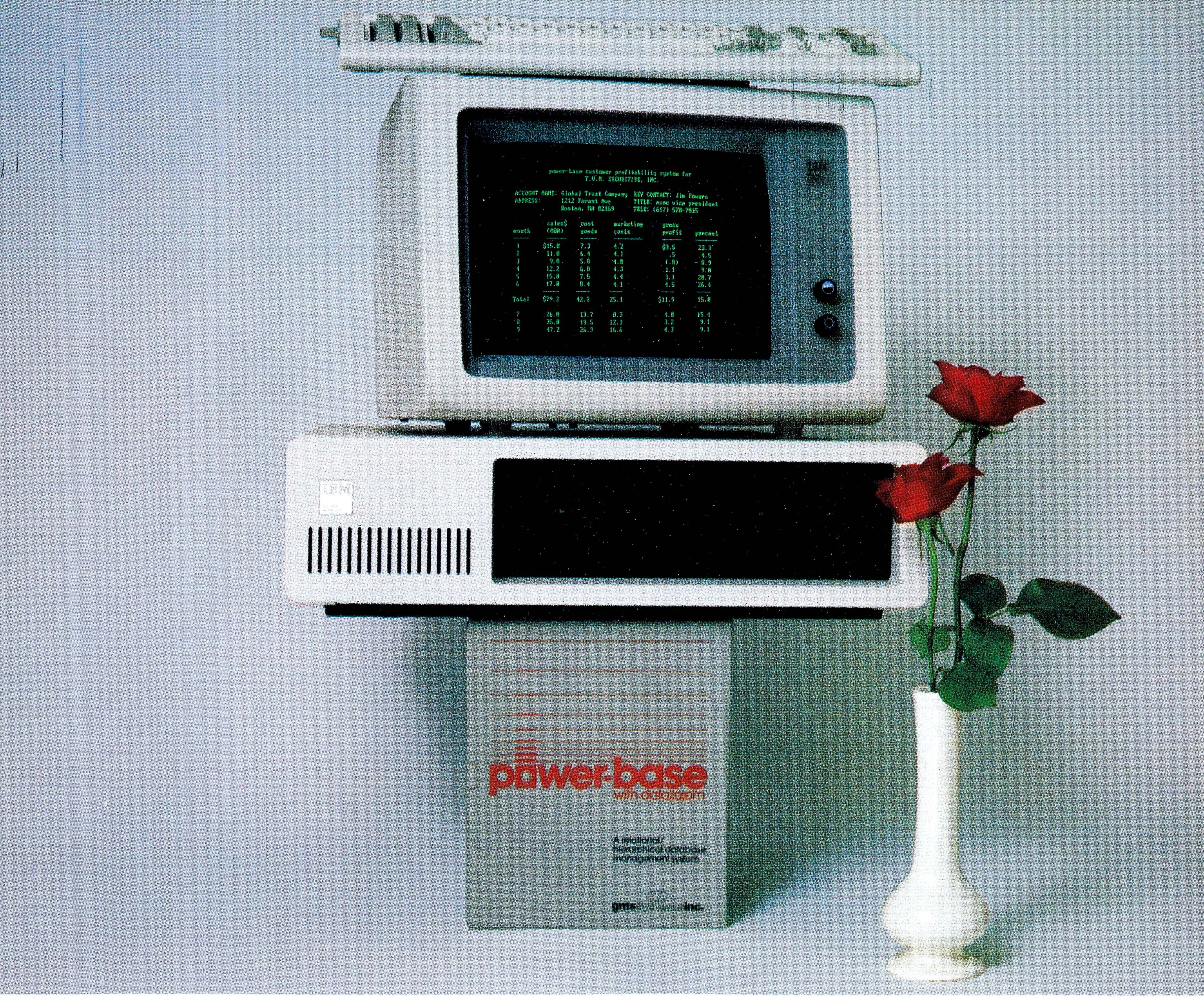

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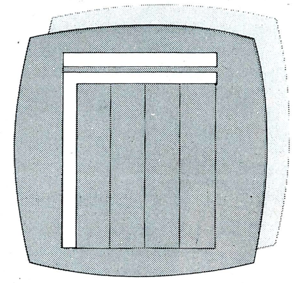

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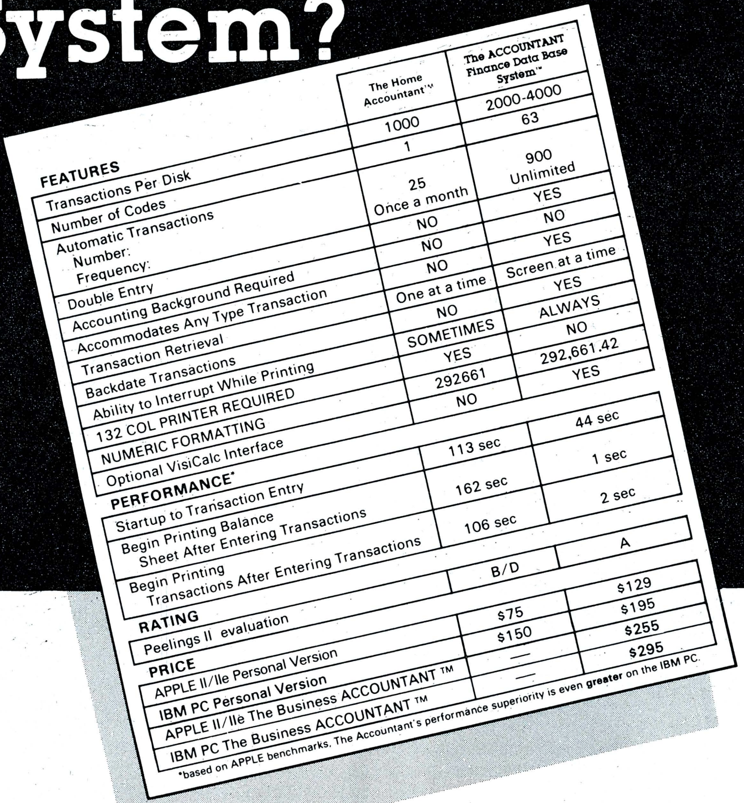

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QUESTIONS & ANSWERS

by Nancy Andrews

Q: I recently purchased an Okidata 92 printer. While I am highly satisfied with the speed and quality of the output, I have been unable to print graphics using the IBM pc.

I am using DOS 2.0 graphics commands, which work fine on my Epson MX80 with Graftrax. I suspect the problem is in the character conversion area and would appreciate any assistance you could give me.

Thomas A. Ewing

A: It looks like your guess is right: Okidata is currently beta testing new PROMs that support IBM graphics. The new PROMs should be available the third week in June at a cost of about thirty-five dollars. If your local dealer doesn't have the PROMs by then, contact the logistics department at Okidata: (609) 235-2600.

Q: I have a pc with two serial ports. Your May column told how to switch between parallel and a serial port, but this didn't work for me.

Here's my problem: I use *Crosstalk*, which only uses Com1: so I have my modem attached to Com1:. I also use *Wordstar*, and since it too sends its output to Com1:, I must continually switch my printer and modem. Can you help me route either *Wordstar* or *Crosstalk* to Com2:?

Rene Resado

A: Microstuf has a new release of *Crosstalk*, version 3.0, which lets you specify which port to use. This should solve your problem. Microstuf is making the new release available to current users for $15. Send Microstuf your original distribution disk and a check for $15, and the company will send you version 3.0 within twenty-four hours. Microstuf's address is 1845 The Exchange, Suite 140, Atlanta, GA 30339.

Q: What is the fastest way to write a page of characters to the screen? By a page, I mean eighty columns by twenty-four or twenty-five rows.

One of the slowest ways would be to use interpreted Basic with a combination of *locate* and *print* commands or *peeks* and *pokes* from memory to the screen. Of course, compiling the code might speed things up by a factor of about ten. Other compiled languages would also be fast, but I think there are even quicker ways.

When using assembler, there appear to be at least two methods to write characters from memory to the screen. The first is to call DOS interrupt 21 (hex), function 9. This prints a string of characters up to but not including the terminating dollar sign. Repeating this instruction in an assembly language program will cause a page to be written to the screen. However, although this method is fast, it is not nearly as fast as some applications I have seen—such as IBM's *Time Manager*. This program can write a page of characters to the screen instantly—no scrolling effect whatever can be seen.

The second assembly language method is to call ROM BIOS interrupt 10H. But alas, due to my inexperience in assembly language programming, I can only write a page to the screen consisting of a single character. This page is written superfast, but writing a character at a time is hardly what I had in mind.

I suspect these applications use some type of DMA, but I have no idea how to go about accessing this in an assembly language program. Do you have any suggestions?

A: Yes, but first let's straighten up a misconception about DMA. DMA, which stands for Direct Memory Access, is a technique whereby peripherals read or write a block of *their own data* from (or into) the computer's memory, without interference from the processor. The processor waits for the peripheral to complete the data transfer; the peripheral can complete the transfer faster on its own than it could by letting the processor read a byte at a time and then store that byte in memory. The video monitor has no internal memory of its own; it is refreshed directly from the memory on the graphics card, which, to the processor, looks just like any other block of memory locations. Thus in this case there is no "peripheral" trying to transfer its own data from (or into) the computer, and hence no chance for DMA. What you are trying to do is simply move blocks of data from one area of processor memory to another.

Now as to your question, there are two ways to rapidly change the entire screen display. The first and fastest is based on switching active pages. Since the video display fades if it is not constantly rewritten, circuitry on the display card constantly refers to a certain area of memory and writes whatever is in that area to the display, a process known as refreshing the display. Because the memory on the display card is wired so that to the processor it looks like any other normal chunk of memory, this technique is known as memory-mapped video. The monochrome display card and the graphics card in alphanumeric black-and-white mode contain more memory

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than is required to display one screen (or page) of text, however. Thus the fastest method to update the display is to write the new screen data into an inactive page and then switch to that page. This results in a virtually instantaneous rewrite of the entire screen, since the data is already in memory and the refresh circuitry need only look to the new page when it starts the next refresh cycle.

In the second method, the active page is not changed, but new data is written directly to it *while* it is active. Although this can involve moving up to two thousand characters (twenty-five lines of eighty characters), if it is done in a tight assembler loop (and such a loop can be extremely tight), to the eye it would appear to be virtually as fast as simply switching pages. There is a caveat to writing directly to the active page, however: Since circuitry is reading from the active page to refresh the screen, you are liable to get momentary bits of garbage on-screen, which will look like static on a regular TV. There is a way around this problem also, and it involves waiting for vertical retrace. Vertical retrace is the period of time when the electron beam is moving from the lower right-hand corner of the screen to the upper left corner to begin a new screen refresh cycle. No characters are written during this transition, so you can safely write directly to the active page of screen memory during this time period. Vertical retrace is signaled by a DOS interrupt.

In terms of both the apparent speed with which the screen is updated and ease of implementation, the better method of changing the entire display is simply to switch active pages: It's the fastest, and you needn't worry about glitching the screen or waiting for retrace. Switching active pages can be done by putting a value of 5 in the AH register and then executing a ROM BIOS interrupt 10H.

If this is what you are doing—there are several video functions available under DOS interrupt 10, and you didn't specify which ones you are using—it's unlikely your problem lies with this part of your code. The problem is much more likely to be found in the way you load the inactive memory page. Assuming your basic code is correct (you *are* updating your source pointer each time you move a character, aren't you?), the problem is probably to be found in your choice of BIOS routine to load memory. In particular, note that under interrupt 10H there are three BIOS routines to move characters to screen memory. Two of those routines (AH=9 or 10) *do not update the cursor* when you are writing to the inactive page. Thus if you positioned the cursor at row 1, column 1, and proceeded to write characters, each successive character would overwrite the previous character, and you would end up with a one-character page. If you are using either of these functions, update the cursor after each call. Alternatively, you should be able to use the WRITE_TTY routine (interrupt 10H, AH=14), which updates the cursor automatically after each write.

Here's a short routine to move a block of characters from one area of memory to another. You can use it to write characters directly to the active page, or better still, write characters to an inactive page and then change active pages.

```
;This routine copies a user-maintained text buffer into the text
;video RAM. This user text buffer is assumed to be a sequence of
;ASCII characters. No attribute byte is currently allowed,
;although one may easily be added by doubling the size of the text
;buffer, removing the INC D1, and changing the MOVSB to MOVSW. The
;correspondence between bytes in the buffer and chars on the
;screen is that the character at the Ith column and Jth row is N
;bytes from the start of the buffer, where N = (J-1)*80 + (I-1).
;(Column 1, line 1 is in the upper left corner.)
;
; At entry: DS:SI is the segment:offset address of the user's
; text buffer. ES:DI is the segment offset address of the video
; RAM.
;       monochrome video RAM = B000:0000
;       color card video RAM = B800:0000 (page 0)
;       color card video RAM = B800:0800 (pg 1, 40 col)
;       color card video RAM = B800:1000 (pg 1, 80 col)
;           Pages 2-3 (80 col) and 2-7 (40 col) found by
;           adding 1000H or 800H to offsets
```

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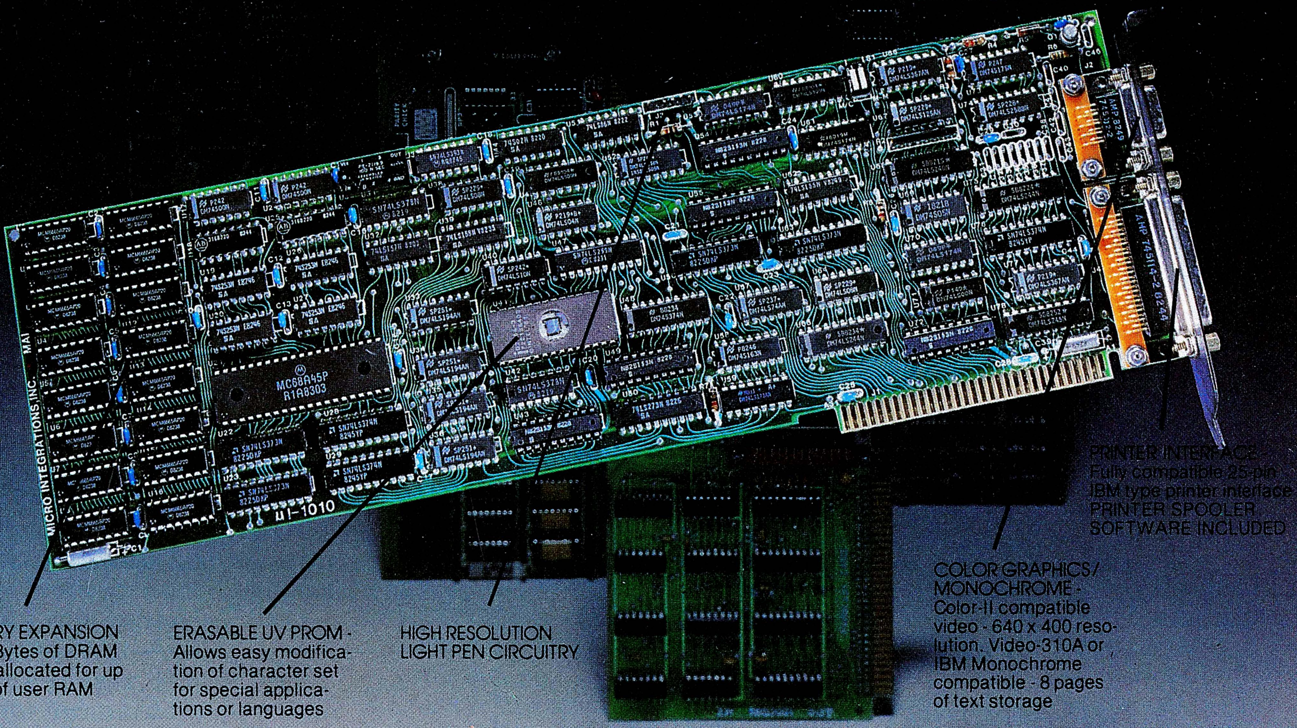

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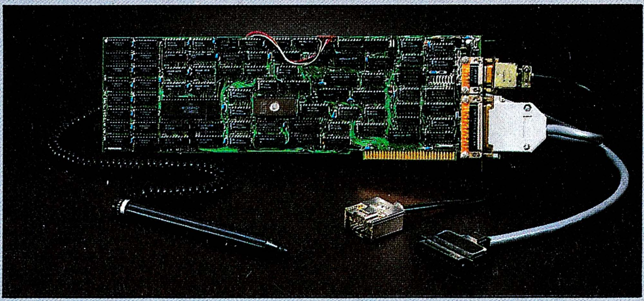

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```
; CX is the number of bytes in the user's text area to copy
;        38EH for 40 col mode, no attributes
;        D70H for 40 col mode, attrs included
;        7D0H for 80 col mode, no attributes
;        FA0H for 80 col mode, attrs included
; At exit: CX, SI, DI destroyed, all other regs preserved

ASSUME CS:THISSEG, DS:THISSEG,
ASSUME ES:THISSEG, SS:THISSEG
THISSEG            SEGMENT

FLASHSCREEN        PROC NEAR

                   PUSH CX
                   PUSH SI
                   PUSH DI

COPYLOOP:          MOVSB              ;Copy a byte from DS:SI to
                                      ;ES:DI and then increment
                                      ;both SI and DI
                   INC  DI            ;Skip attr byte in video RAM
                   LOOP COPYLOOP      ;Decrement CX and if
                                      ;the result isn't 0, go back
                                      ;and copy next byte
                   POP  DI
                   POP  SI
                   POP  CX
                   RET

FLASHSCREEN        ENDP

THISSEG            ENDS
END
```

Q: In writing assembly routines to allow BIOS calls from IBM Pascal, I've come to an impasse with the ACT–DIS–PAGE procedure (BIOS listing, line 3570). When I attempt to set an active page other than page 0, and then write to that page, I see only the first and last characters written. It is as if the cursor were not being updated. Using the same routine to turn back to page 0, everything is fine. My listing follows:

```
setpage   proc     far
          public   setpage
          push     BP              ;save caller frame pointer
          mov      BP,SP           ;establish new frame
          mov      AL, [BP+6]      ;get page
          mov      AH,5            ;set function to select active page
          int      10H             ;invoke BIOS
          pop      BP              ;restore caller frame pointer
          ret      2               ;clear stack
setpage   endp
```

Any suggestions? Am I correct in assuming that Pascal's *writeln* ultimately calls the BIOS routine WRITE TTY via DOS interrupt 21, function 2? Thanks for your help.
Robert Wohlhueter

A: Our readers seemed to be plagued lately by a faulty cursor incrementing. No, you are apparently not right, since WRITE TTY is the one function that does increment the cursor. You have several choices to handle string output to pages other than 0. Probably the safest choice is to use BIOS function call 9 to print a string. That function uses the default attribute, however, so it won't let you use color. If you need color, you can use the BIOS call to write a string (see page 1–19 of the *Technical Reference* manual). As long as you're messing around in assembler, you will probably find the routine presented in reply to the previous question useful. But if you want to do your writing in Pascal, why not write one character at a time and then call a routine that updates the cursor? ▲

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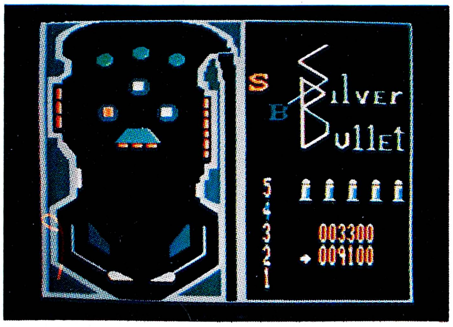

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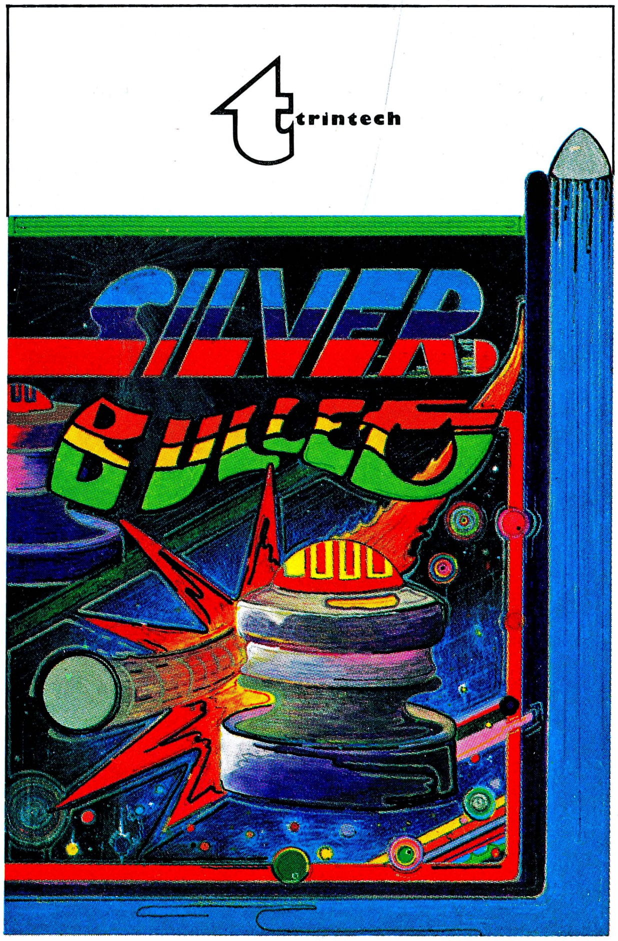

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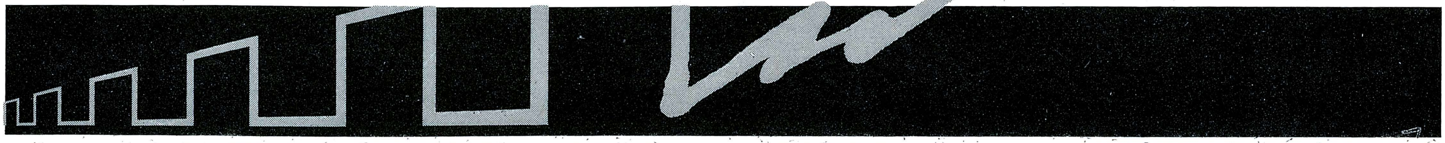

BY KEVIN GOLDSTEIN

Last month we talked about some of the effects the computer-telecommunications combo might have on our world by the end of the decade. This month we'll start by taking a brief look at some important events in the history of telecommunications, a look that will lead to some very practical discoveries. That done, we will return to the present and see how we can put some of these discoveries to use. Finally, we'll look at a few of the new and exciting ways we can make telecommunications technologies serve us in our own homes.

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If technologies were people, microcomputers would be kids and telecommunications would be old men. Several of today's very popular telecommunications technologies have been around quite a while—the technologies behind low-speed asynchronous communications across the direct distance dial telephone network, for example. Because those telecommunications technologies have been in use for so long, a number of standards have evolved that are universally recognized and adhered to.

The first company to slap modems onto telephone lines was Ma Bell, back when AT&T was AT&T, a monopoly consisting, for our purposes, of the following elements: AT&T long lines (the branch responsible for the long-distance carrier channels); a variable number of operating subsidiaries (you're safe calling it twenty-two); Western Electric, the manufacturing arm; and Bell Labs, the research arm. AT&T, not so affectionately known as Ma Bell, was the only company allowed to hook up equipment directly to the telephone line, which Bell held to be almost sacred property.

Whatever can be said against monopolies, they have one thing going for them: Because a monopoly is the only game in town, it offers no chance for competing technical specifications to develop; compatibility between equipment from various manufacturers never becomes an issue. Before the Carterphone decision in 1968, in which the courts essentially ruled that AT&T could not prevent outside suppliers from hooking their "foreign equipment" directly to Bell telephone lines, about the only way to send data over a telephone line was via a modem rented from the phone company. The most popular modem was a low-speed number designated the 103; it could send and receive data simultaneously at up to 300 bits per second, although it was more generally used at the 110-bit-per-second rate of the ubiquitous Teletype. The Teletype, incidentally, also came from Bell, via Bell-owned Teletype Corporation.

Since it was the first—and for a long time the only—low-speed modem, Bell's 103 became the standard for low-speed communications. Even today, with a few score of companies cranking out modems in a dizzying array of flavors—dumb to brilliant, in a box or on a board—the technical specifications of the 103 remain the low-speed standard, and practically every maker of low-speed modems describes its offering in this category as "Bell 103-compatible." In a coming issue, we'll discuss just what 103-compatibility means technically; for now, it's enough to know that if someone in the computer industry is talking about a low-speed modem, he's probably talking about a box that's Bell 103-compatible, and thus capable *at the hardware level* of talking over the phone line to almost all existing low-speed modems.

"At the Hardware Level." Note the "at the hardware level" that was slipped in there: Although two systems might use identical modems and thus be compatible at the hardware level, they might still not be able to exchange anything but gibberish if the computers they are connected to aren't also compatible at the software level. If your computer uses seven-bit ASCII and your friend's uses an eight-bit code called EBCDIC, it won't be enough that you can receive each other's bit streams correctly; there will still be work to do before you're compatible. We'll get into this concept of layers of compatibility in a later issue.

So the Bell 103 specifications became one of the first de facto standards for low-speed telecommunications. Bell was concerned with its phone line, and being Bell 103-compatible meant (and still means) a modem would put encoded data onto the phone line in a manner compatible with the 103 modem made by Bell.

Of course, the phone is only one of the communications pipes connected to the phone line. The other communications pipe (which we'll now start calling by one of its more conventional names—input/output channel or input/output port or, more simply, I/O channel or port) is connected to the computer. Thus there are two places, at the hardware level alone, where incompatibility may arise: first at the computer or terminal side, and second at the phone line side. (Modems, as we shall see, are nothing more than a high-tech Pandora's box. Before long in your introduction to the mysteries of communications, and to high-speed synchronous modems in particular, you may become convinced that the sole *raison d'etre* of a modem is to present you with a box that can go wrong in as many ways as possible. Let's hope this series will steer you around some of the more, er, interesting potential snafus.) Fortunately, most low-speed modems that come as standalone boxes, rather than as plug-in cards, have also settled upon a standard for the computer-side port; that standard is the RS-232 interface about which you've heard so much. RS-232 is a very important standard; we'll return to it in a later issue when we can give it the space it deserves.

The prevalence of standards in the telecommunications arena contrasts markedly with the incompatible hodgepodge of specifications in the immature microcomputer field. It's possible, however, to use those telecommunications standards to bring some measure of compatibility to microcomputers. Suppose, for example, that we want to have our IBM pc process a data file that a friend has created on an Apple disk. Industry standards for formatting 5 1/4-inch disks hardly exist (although IBM's pc format is showing strong signs of becoming a de facto standard), so there is no direct (or at least no direct and cheap) way of hooking up the pc so it can read Apple disks. But we can fall back on the standardization that exists in telecommunications technologies to connect the two computers through a modem and exchange files that way.

As you've probably noticed by now, standards are an extremely important part of telecommunications, and we will spend a good deal of time getting to know the more useful ones. When you think about it, the importance of standards to telecommunications technologies is practically a given: For communications to be successful, the communicators must be speaking the same language and using the same medium. Thus, studying telecommunications means learning about the standards computers use to communicate, just as studying communications between people involves studying the standards people use to communicate—English, French, body language, or whatever. The Bell 103 and RS-232 standards are two well-established workhorses of the computer industry. Other standards, such as those for tying groups of computers or equipment together into networks, are still being developed. Some of the standards being developed, such as those for local-area networks (LANs) like Ethernet, may already be familiar to you.

Mininetworks for the Home. To an individual, a standard that may be much more exciting than the LAN is the SAN: the small-area network. Just as a LAN can be used to connect equipment in different rooms of one building, or in closely located but separate buildings, so a SAN can connect equipment within the same room, or in different rooms of the same not-too-large building. But while a LAN operates at high speed and is targeted to businesses needing to connect computers, fax machines, and the like, a SAN operates at a much lower speed, one appropriate for sending control signals to your stereo, television, or answering machine.

Have you ever wished you could call home and tell your computer to turn on the air conditioning, flip a few lights on and off to confuse any potential burglar, then replay the phone messages and forward your calls to your friend's house? It's exactly those kinds of things that SANs will be used for. Some early stabs at SANs already exist. One large integrated circuit manufacturer, Signetics, a subsidiary of giant Philips Semiconductor of Europe, is manufacturing a SAN chip, which means that in time you'll be able to make a mininetwork of your stereo, appliances, and personal computer—a computerized home of the future to match the much-ballyhooed office of the future.

Actually, something very close to a SAN for the home already exists. The Home Control System, manufactured by BSR (the same company that makes turntables and other audio equipment) and sold by Sears and Radio Shack under their own names (as well as by other retailers under the BSR name), sends digitally encoded data through a serial communications channel to a network of terminals; but the "terminals" in this case are light dimmers or appliance switches and the communications channel is the 110-volt ac power line that runs through the house.

Piggybacking data onto the power line is known as carrier-current transmission; it's a good way to distribute low-speed data within a small area, and indeed, there are such things as modems that use carrier-current transmission techniques. You simply plug your equipment into the house power line, and you have established both the power *and*

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the communications-line connections. (Such modems are not Bell 103-compatible.) Carrier-current transmission is limited by the practicalities of house wiring: As long as the whole house shares common wiring, the data will be available anywhere in the house.

Several companies are already manufacturing boards for the IBM pc that let the computer control light-dimmer and appliance switches; plug such a board into your pc and you'll have created your own personalized SAN.

By now it's becoming clear that the little scenario presented earlier—calling home to direct your computer to turn off the air conditioning, flip a few lights on and off, then replay phone messages and forward any calls—is not so far-fetched. As a matter of fact, the combination of one of those plug-in boards to connect your computer to your home control system and an auto-answer modem to enable you to access your home computer via telephone could constitute a neat little system capable of doing almost everything we discussed. You could even buy a board that decodes Touch-Tone signals, so you wouldn't need to call your computer from another computer.

You would still have trouble with one thing, however: getting your computer to replay your phone messages.

Texas Instruments is a company deeply afflicted by the NIH syndrome: If it was Not Invented Here, TI doesn't want to sell it. But when it looked at the domination of the personal computer market that IBM was attaining, TI decided it would offer a computer that would be compatible with the IBM pc at the software level, if not at the hardware level (you can swap some disks—all data disks and some program disks—between the two machines, but you can't swap boards). So TI swallowed hard and decided to use Intel's 8088 processor rather than its own 9900 machine, the latter a worthy microprocessor that never caught on. In order to differentiate its machine, dubbed the Professional Computer, from the hordes of other pc-compatibles, TI decided to offer some specialized hardware. That hardware turned out to be a real zinger.

His Master's Voice. The heart of TI's new offering is a device that's both a voice digitizer/synthesizer and a voice-recognition unit. The voice digitizer/synthesizer lets you do such things as store digitally encoded voice messages on your disk in files and access them much as you now access digitally encoded text files (the difference being that text files must be output to a display screen or printer to make sense, while voice files go to a speaker). The system also contains a nifty little circuit capable of decoding Touch-Tones.

Now, suppose you recorded on disk messages for five of your friends. Make up a number for each friend, and tell them that when they call you they should type in that number on the Touch-Tone keypad. Since the TI board includes a modem that can answer the phone and decode Touch-Tones, you can now program your computer as a smart answering machine capable of answering the phone and delivering a customized message to each of your friends. It could then take a verbal message, digitally encode it, and store it on disk. Later, you could call your computer and *tell* it (the board has a voice-recognition unit capable of understanding a minimum of forty words from one speaker) to replay all of your messages, or maybe just the messages from friends five and three.

Taken one step farther—having the computer call you automatically to deliver the messages—this process would go by the fancy name of store-and-forward message switching; TI's board is just the ticket for setting up your own private store-and-forward message switcher. Or, by calling the computer on one line and having it connect you to a second line to dial out, you could effectively implement your own miniature private phone exchange (PBX). So it turns out that it's possible to do right now all of the tricky things described earlier, as well as a host of others limited as much by your imagination as by technology.

Don't be put off by the fact that TI's board won't work in your pc. Tecmar has already announced a board with very similar capabilities, and it's a sure bet that if TI's board attains half the popularity the industry is expecting, work-alike boards for the pc will be available from manufacturers such as AST, Quadram, and Tecmar. The boards use what is known as a *codec*, or coder/decoder, to digitize voice or synthesize voice from a digitized voice file. Codecs are a key component of Bell's plans for a fully digitized phone network: Just as they can be used to digitize voice and store the resulting bit stream on disk, so can they be used to digitize voice and send the bit stream out over a digitized phone network, like the one discussed in last month's installment. We'll examine codecs more closely in a future issue, at the same time getting a better understanding of how a board like TI's works.

Next month in Comm Lines, we'll start discussing some of the more important technical concepts, such as bandwidth and analog versus digital signals, and examine the practical implications of those concepts for telecommunicating with the IBM pc. ▲

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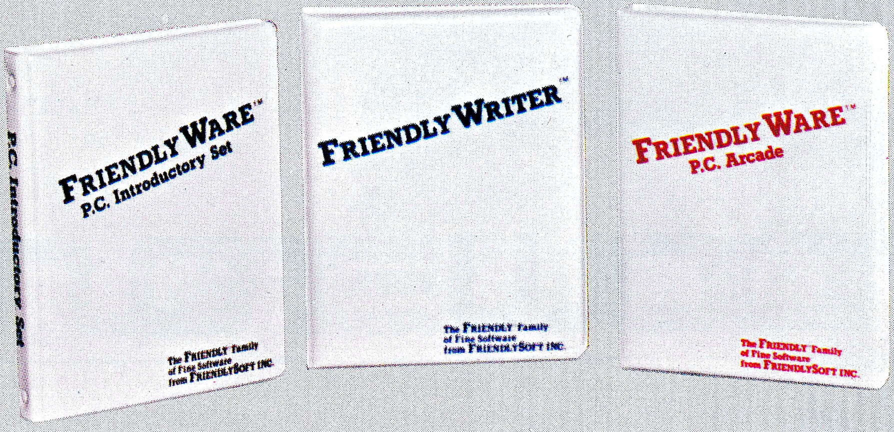
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AMDEK Color-I

The men behind the monitors. Go Sugiura, far right, is the president and founder of Amdek. Ted McCracken, center, a former computer store owner, is now Amdek's director of engineering. Dan Rimes, left, never had a formal education in sales and marketing, but he's taken on those jobs at Amdek.

EXEC AMDEK

WINDOW TO THE

by David Hunter

Amdek Corporation has been lucky. One of the first few dozen companies to start up around the microcomputer industry, Amdek (formerly Leedex) has survived by taking chances — and more than once has experienced pleasant surprises.

A case in point is its introduction of an RGB monitor into the microcomputer market. In early 1981, an RGB monitor was an expensive item for a personal computer owner. Amdek, unsure whether the monitors would sell and fearful of jeopardizing its livelihood, committed cautiously to its overseas manufacturer.

Practically the same day the monitors were delivered to Amdek, IBM announced the Personal Computer, which had color capabilities requiring an RGB monitor. Suddenly Amdek had not ordered enough units and was caught short, but that was only a minor problem. A whole new market was emerging, and Amdek was in a good position to move in with gusto.

Luck, courage, wisdom and skill have made Amdek what it is today. It's the old story of one individual's dream come true through hard work and sacrifice. It's also the story of a part-time consulting engineer, an energetic sales manager, and an island country called Japan.

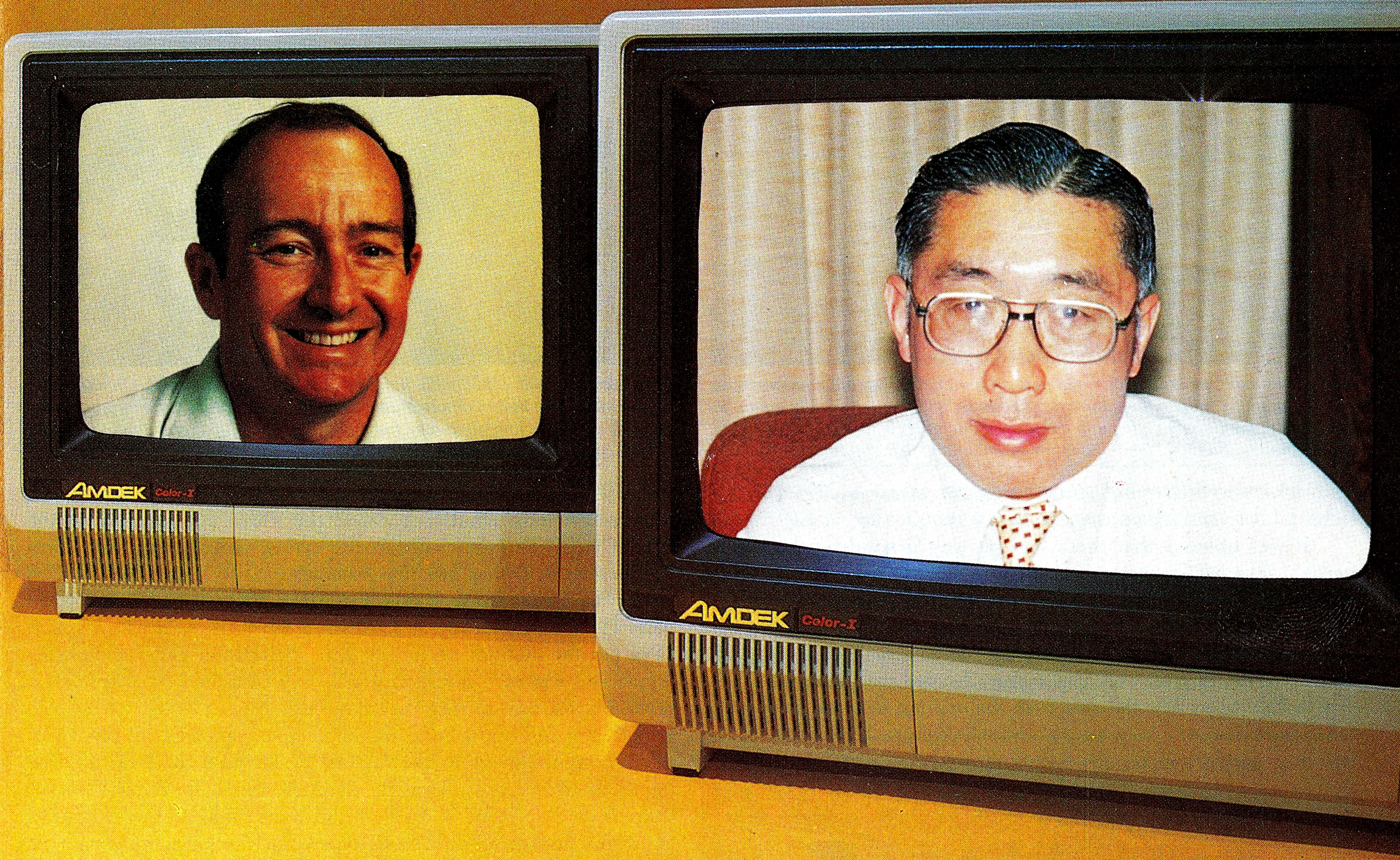
The Far Traveler. Go Sugiura, president and founder of Amdek, left Japan about twenty-three years ago. Since then, he has lived in Caracas, Venezuela, and the western suburbs of Chicago, following the same basic calling for six years at the first location and seventeen years at the latter.

The importing and selling of electronics products produced in Japan is a way of life for Sugiura—an exciting, hectic, sometimes risky way of life. Since the summer of 1977, Sugiura has been in business for himself, and the risks and excitement have doubled or tripled. In seven years, Sugiura has gone from managing the sales office of a Japanese company to heading his own company—a journey that has had both rough turns and stretches of almost unbelievable progress.

Seventeen years ago in Caracas, Sugiura was in the right place at the right time. He was working in the business of importing various product lines from Japan.

"One of the companies I was dealing with wanted to open a sales office in the United States," Sugiura recalls, "but they didn't have qualified people at that particular moment. So they came to me and I saw that there was tremendous opportunity in the U.S.—the biggest market in the world—business opportunities and career opportunities. So I decided to move to the States."

This year Sugiura may be more thankful than ever that he made that decision; it has taken him far from his homeland and yet has



FUTURE

brought him wealth, security, and the promise of more opportunities and even greater rewards in the future. Amdek is a company on the move.

Enter the Consultant. In the last two and a half years, Amdek has gone through a several-hundred-percent increase in personnel and a shift in emphasis that now sees the company becoming purveyors of an exciting line of peripheral products for a number of different personal computers.

Amdek's success has been realized through the efforts of many people, not the least of whom is the company's director of engineering, Ted McCracken.

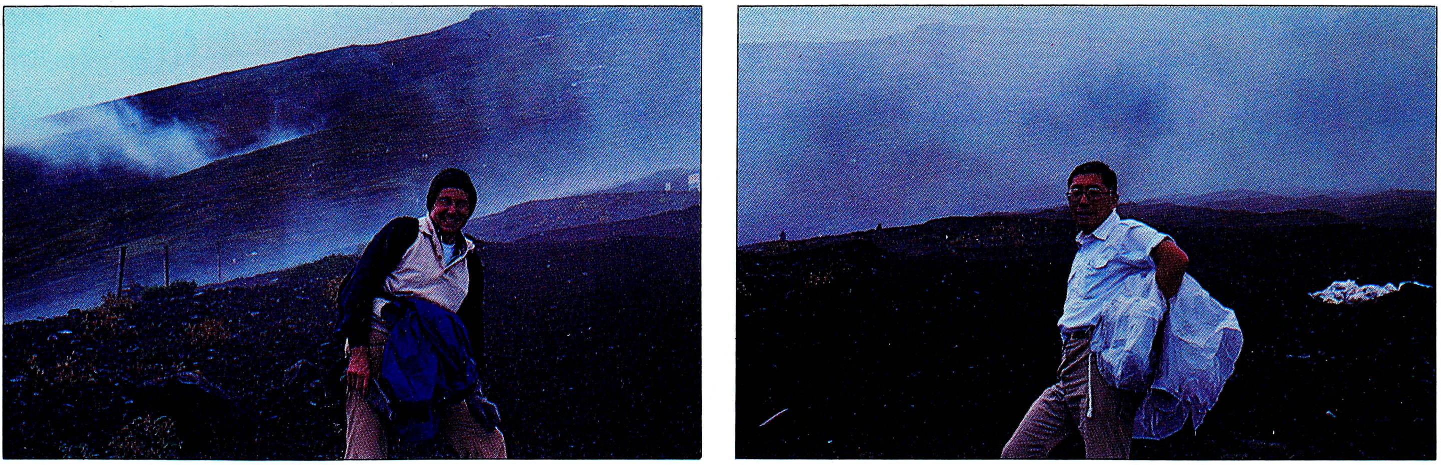
After earning a master's degree in electrical engineering from the University of Missouri at Columbia, McCracken worked for RCA, designing disk drives for minicomputers. In 1971, RCA left the minicomputer business and McCracken soon ended up in school back in Missouri. While earning his doctorate, McCracken also worked at the University of Missouri; after graduating, he took a temporary faculty position there.

In 1976, when the first microcomputers were appearing, McCracken started a consulting group to design interfaces for minicomputers, specializing in Perkin-Elmer's line of business machines. That year, McCracken's and Sugiura's paths crossed for the first time—under less than ideal circumstances.

McCracken was consulting for a bank that was foreclosing on an electronics company. Sugiura had sold components to the company on an open account and had never received payment. In the process of meeting with the bank, Sugiura met McCracken and, despite the gloomy atmosphere of that situation, a friendship developed between the two men. In the following year, Sugiura called upon McCracken frequently for advice.

When he first struck out on his own in the summer of 1977, Sugiura called his company Leedex. It was basically a continuation of the business he had been in before—the sale of Japanese electronics components to OEMs. The name was changed to Amdek early in 1981, when an Ohio company called Ledex, which makes connectors and small motors, voiced displeasure over the confusion that had arisen among some consumers. "We had no choice but to change," says Sugiura.

Sugiura began thinking about importing monitors around the same time McCracken saw his first Apple. That was June 1977. Later that year, McCracken got a call from Sugiura, asking for advice as usual, and a little more this time. Sugiura had found a monitor during his travels to Taiwan that he thought might interest Atari, a company that was just getting into the arcade business with

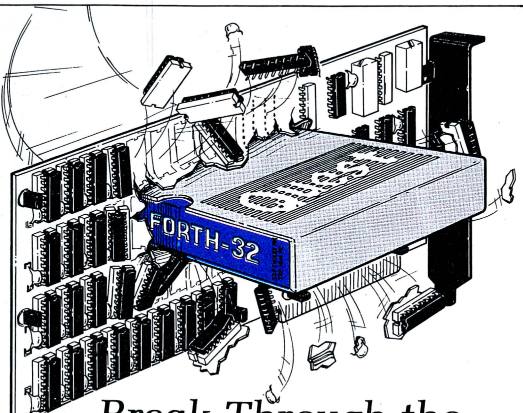


McCracken and Sugiura are pictured here on top of Mt. Fuji. McCracken, who jogs up to seven miles a day, convinced Sugiura, who swims a mile a day, to climb to the top of Japan's famous volcano on one of their frequent trips to the island country. Sugiura, who was born in Japan and left the country twenty-three years ago, had never made the climb before. Sugiura and McCracken met in 1976, when the first microcomputers were appearing. Although they are in the business of importing products from the Far East, they feel that the major technological innovations are still coming from the U.S.

its black-and-white pong games. Sugiura asked McCracken for technical assistance before showing the monitor to Atari.

"It was obvious that there was no way it would meet Atari's needs," says McCracken. "I told Go it wouldn't do, but if it was modified somewhat, it would be good for the Apple."

The only other monitors available at that time for the Apple, besides owners' television sets, were the Sanyo nine-inch black-and-white models. Sugiura and McCracken decided that it might just be worthwhile to modify the design of the existing monitor, import the redesigned monitors in quantity, and sell them to Apple owners for less than they'd pay for the Sanyo model.



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After making modifications and improvements, Sugiura and McCracken took what they called the Video 100 monitor to the West Coast Computer Faire in the spring of 1978 and to a computer show in Dallas late that summer.

At the Dallas show, Sugiura shared a booth with another company for the modest fee of $370 for a ten-foot-by-ten-foot space. "We put the monitor on a desk with a character generator on the Apple and waited," says Sugiura. "Very surprisingly, there was a favorable reaction during the show."

Off On the Right Foot. Sugiura remembers that his first production commitment to the factory in Taiwan—for five hundred monitors—was quite a gamble. In international purchases everything is paid up front. If the monitors didn't sell, Leedex, Sugiura's company, probably would have folded. Luckily, the gamble paid off and that first batch sold.

Through 1979 and 1980, Sugiura, with consultation from McCracken, continued to pursue the microcomputer market. In the fall of 1980, Sugiura decided to introduce a color monitor—today's Color-I. There had been great demand for a color monitor, but Sugiura had not previously been able to find a suitable model in his frequent trips to Japan and Taiwan.

From the time of its introduction, the Color-I was a hit and fueled Sugiura's further ventures into the color monitor business. By the end of 1980, Sugiura essentially phased out the selling of electronics components and was concentrating on peripherals for microcomputers. McCracken stayed in Missouri, dividing his time between teaching at the University of Missouri in Rolla and consulting for Sugiura.

McCracken says that each year he has devoted more time to Amdek. This year he finally "gave up" teaching for a while and took a year's leave of absence from the University of Missouri faculty. McCracken plans to return to teaching but says he's having "too much fun right now to miss it."

After the Color-I, Sugiura looked next at higher-resolution color monitors; eventually, he approached Hitachi about an RGB monitor it was manufacturing. At the time, Sugiura says the retail cost had to be around a thousand dollars per monitor, and he said to himself, "Boy, there'll be nobody who'll pay a thousand dollars for a color monitor, but as long as we have a sample, let's show it." This was just before the West Coast Computer Faire in early 1981.

Once again, Sugiura and McCracken were surprised—this time by the favorable reception the RGB monitor received at its introduction in San Francisco. The two entrepreneurs left the show thinking they could sell perhaps five hundred a year. Soon after the favorable showing of the RGB monitor at the Faire, Sugiura made a commitment to the factory for five hundred units. You know the rest of that story.

The Color of the Beast. For a number of reasons, 1981 was the real beginning of Amdek's success. The RGB monitor (called Color-II) really took off when IBM announced the Personal Computer. This cleared the way for a lower-cost RGB monitor (Color-III), which Amdek started selling in early 1982.

In November 1981, a key individual joined the Amdek staff: sales manager Dan Rimes. Rimes, whose varied background included running his own microcomputer business and working for such companies as Heath and Autotrol Technology, says he had a "nice background in high-level graphics." One day he wrote a letter to Sugiura and introduced himself, laying out a possible marketing plan for the company.

In the past year, Rimes and his growing staff of sales and marketing people have worked hard to get Amdek's name known and accepted by consumers. "It's really exciting when people walk in a store and ask for Amdek by name. You have no idea what it took to achieve that. I still think of us as 'little Amdek.' "

Well, "little Amdek" has now expanded into four different locations and has more than forty-five employees. The company is headquartered in the Chicago suburb of Elk Grove Village, where Sugiura and Rimes are based. McCracken has a team of eleven engineers working with him in Rolla, Missouri. Sales offices are in Dallas, Texas, and Costa Mesa, California, which is also the location of the main warehouse and the receiving point for all merchandise shipped from overseas.

Sugiura says the operation of Amdek is loosely structured because the company is still developing rapidly. He has no vice presidents and no board of directors, officially, but that situation is bound to change. Jim Ray, formerly with Northwestern Industries, has just been hired to handle finances, freeing Sugiura from the day-to-day hassles he has faced for so long.

Another key individual is Steve Wilson, who joined Amdek in November 1982, after working for RCS, a distribution company in Los Angeles. Wilson is the manager in charge of sales at Amdek's Costa Mesa sales office.

Musically Uninterested. In 1981, Sugiura started to work fairly closely with a company in Japan called Roland. Initially, Amdek and Roland had planned to do worldwide distribution together, but Sugiura says that halfway through the project the two companies took different directions. There is still some confusion surrounding this story, because Roland set up a division called Amdek but didn't change the name when the two firms parted ways.

The difference in opinion—or direction, if you will—arose from Roland's commitment to the music market, which, Sugiura says, "we didn't really have an interest in. We're strictly a peripherals company."

McCracken also found the idea of music systems unappealing: "From my standpoint—the technical side—what I know about music you could print on a fingernail. The Amdek company in Japan is also into lots of kits for hobbyists. Nowadays, the U.S. market for kits is dead, dead, dead, dead. I told Go something to the effect of 'We go into kits over my dead body.' "

Sugiura admits the situation is confusing, and so does McCracken. As it stands, there are still two Amdeks. At the moment, Sugiura's Amdek doesn't market in Japan and the one in Japan doesn't market here. According to McCracken, Europe is the one place of possible confusion and Sugiura's Amdek is planning to market heavily there in the not-too-distant future.

"But we're all on the same team," McCracken says. "It's just a matter of finding the best way to sort it out."

For the American Amdek, the affair was not a total washout. Sugiura did pick up a one-pen plotter—now known as the Model DXY Plotter—from the Japanese Amdek, and he has been selling it

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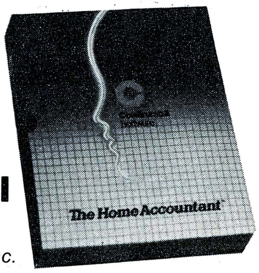

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The Amdisk-V half-height five-and-a-quarter-inch drive is a nifty product, as is the Amplot-II six-pen plotter. Sugiura picked up both from Hitachi and is just now introducing them in the market.

The Incredible Shrinking Disk. The exciting product for the IBM Personal Computer that Amdek is just starting to ship is the Amdisk III, a dual three-inch microfloppy disk drive. Sugiura and McCracken realize the product is another gamble for Amdek, but the two are confident it will achieve success on the market.

"There's a lot of confusion right now, with all the different kinds of sub-five-and-a-quarter-inch drives," says Sugiura. "Everyone is saying they have the standard, but we believe there is a possibility it will be the three-inch."

The Amdisk III drives are manufactured by Hitachi and, McCracken notes, in Japan the three-inch drive is more or less becoming standard. "Sony is the only company making three-and-a-half-inch drives. Companies like Mishusta, Cannon, Sayko, and others are all making three-inch drives. Whether or not three-inch becomes the standard in this country, you're going to see a lot of Japanese portable computers in the next few years with three-inch drives."

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Two or three months ago, McCracken was still skeptical about the three-inch drive, but lately he's feeling a little more confident about it. "Sony did a tremendous job of marketing and made it seem that this country wanted three-and-a-half-inch drives as the standard.

"They [Sony] tried to get the American National Standards Institute to rule on the microfloppy standard in favor of the three-and-a-half-inch," McCracken explains. "ANSI rejected it, because the Sony drives were not compatible with existing five-and-a-quarter-inch formats."

Currently, Amdek is offering only single-sided Amdisk III drives, which, Sugiura says, are definitely "not as attractive" as the double-sided standard set by IBM for the pc. Later this year, Amdek will release double-sided Amdisk-IIIs.

The three-inch disks themselves will seem a tad expensive at first—probably $6.99 each. This price will surely drop with time, says Rimes, and it could very easily have started at ten dollars.

At Comdex this April in Atlanta, Amdek announced that thirteen software companies—including some of the biggest names in Apple, Atari, and IBM software—would support the three-inch-disk format. Those companies are Broderbund, Sirius, Hayden, Datamost, Continental, TMQ, BPS, Sierra On-Line, Penguin, Synapse, Computer Systems International, Tab Books, and PCsoftware.

Amdek is getting into cross-marketing, says Rimes. Working with third-party vendors, Amdek bundles together one or more pieces of hardware with software and sells it as a package. The first major venture in this direction in the pc market is Amdek's business system—which includes a Color-II monitor, a Model DXY one-pen plotter, the MAI board, and BPS's *Business Graphics* software. The bundle also offers as hardware options the Amdisk III and Amplot II.

Three times a year Sugiura and McCracken travel to Japan and Taiwan to maintain contact with manufacturers and look for new products. "They always have something to show us," says McCracken. "We didn't just decide one day to sell a three-inch disk drive; Hitachi came to us and said, 'Would you like to market it?' There's a tremendous reservoir of products in Japan."

Whenever he visits Tokyo, McCracken makes a point of walking around the Akihabara district, where the consumer electronics businesses and stores are concentrated. "It scares the heck out of me," he admits. In a sixteen-by-two-block area there are thousands and thousands of television sets, stereos, computers, and everything imaginable. And there are always a million people, it seems, sorting through the goods.

"There is a momentum building in Japan, a computer momentum. It's going to be tough to compete with the Japanese on the international level.

"The whole country is really getting cranked up for going big into consumer computer merchandising. And they're starting to make the right decisions on software. It's going to be tough sledding for some American companies when those Japanese companies start unloading products.

"Of course, I speak with a forked tongue," says McCracken, "what with three Datsun automobiles in my driveway and me working for a company that's importing Japanese products as fast as we can get them off the boat."

Over Here. According to Sugiura, the United States represents to Japanese industrial companies the single largest market in the world and, in order to grow, those companies must sell their products here.

"They do their homework to come up with marketable products, and once they set a goal, they go after the market as strongly as possible. Sometimes they'll get a little too aggressive and that will have a reverse effect. That's one of the things we see happening today.

"The Japanese think this is the country of unlimited potential and technology and strength that nobody in this world can match. But, at the same time, they feel, well, the U.S. has sat on that power a little too long. Things are too easy here.

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"My observation has always been that the consumer in the United States compared to the consumer in Japan is just an angel," Sugiura continues. "American consumers are generally too understanding, too patient. You can use a half dozen unprintable words to describe the consumers in Japan. They don't *want* to understand. They don't *want* to be patient. They just demand—more than what they're paying for!

"And that is a pressure felt by the dealers and the manufacturers. That's the big factor that has brought Japanese products to the quality level they have now. One of the most common comments I've heard from Japanese companies is 'It's easy over there in the United States.' "

According to Sugiura, the practices of some American dealers—those who claim to test each product received before putting it on the shelf—would be an insult to a Japanese manufacturer. "In Japan that's totally unheard of—the dealer not trusting the product.

"Over here you may buy a copier and think it's no big deal to pay ninety dollars for a service contract. It's an admission—by the company—that this machine could possibly break down within the year. Of course, there are a lot of factors—cost of labor and so forth—and I can understand that. But in Japan when you pay three thousand dollars for a machine, it's got to last a year or two.

"The basic attitude of the consumers in this country is not giving enough pressure to the manufacturing companies. Whenever consumers have a problem, it's either a multimillion-dollar lawsuit against some major corporation or no voice at all.

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Although he looks for new products in Japan, Sugiura believes the major technological developments are still coming out of this country. The Japanese are strong at manufacturing and can always be expected to take existing products and make similar ones with improvements. And Amdek will continue to take advantage of this situation.

Window to the Future. Salesmen are wont to come up with catchy phrases. Rimes has come up with a fine description of Amdek's past, present, and future. "Monitors," he says, "are windows to a personal computer. And monitors for Amdek have been a window into other areas. Monitors have been the jumping-off point for a whole line of peripheral products."

This year will probably be the most crucial yet for Amdek. With new and challenging products on the market now and more on the way, Amdek is taking chances. For Sugiura, McCracken, Rimes, and the rest of Amdek, 1983 should be an interesting year.

And although there's always the unpredictable, Amdek has proven it has the talent and experience to adapt to the changing personal computer scene. ▲

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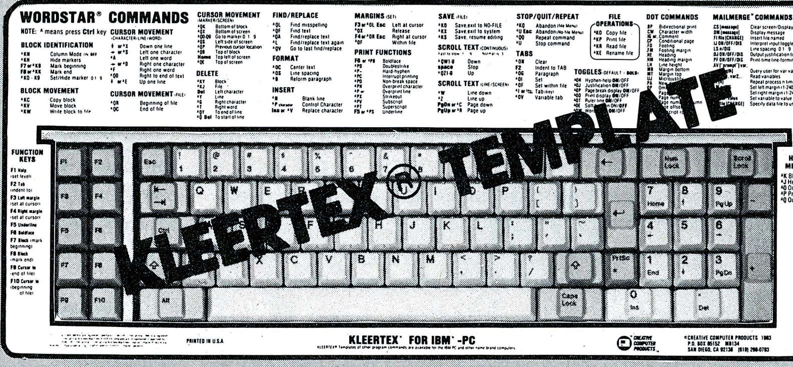

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Part Two of a Series

HOW BASIC STORES VARIABLES

by Gary Little

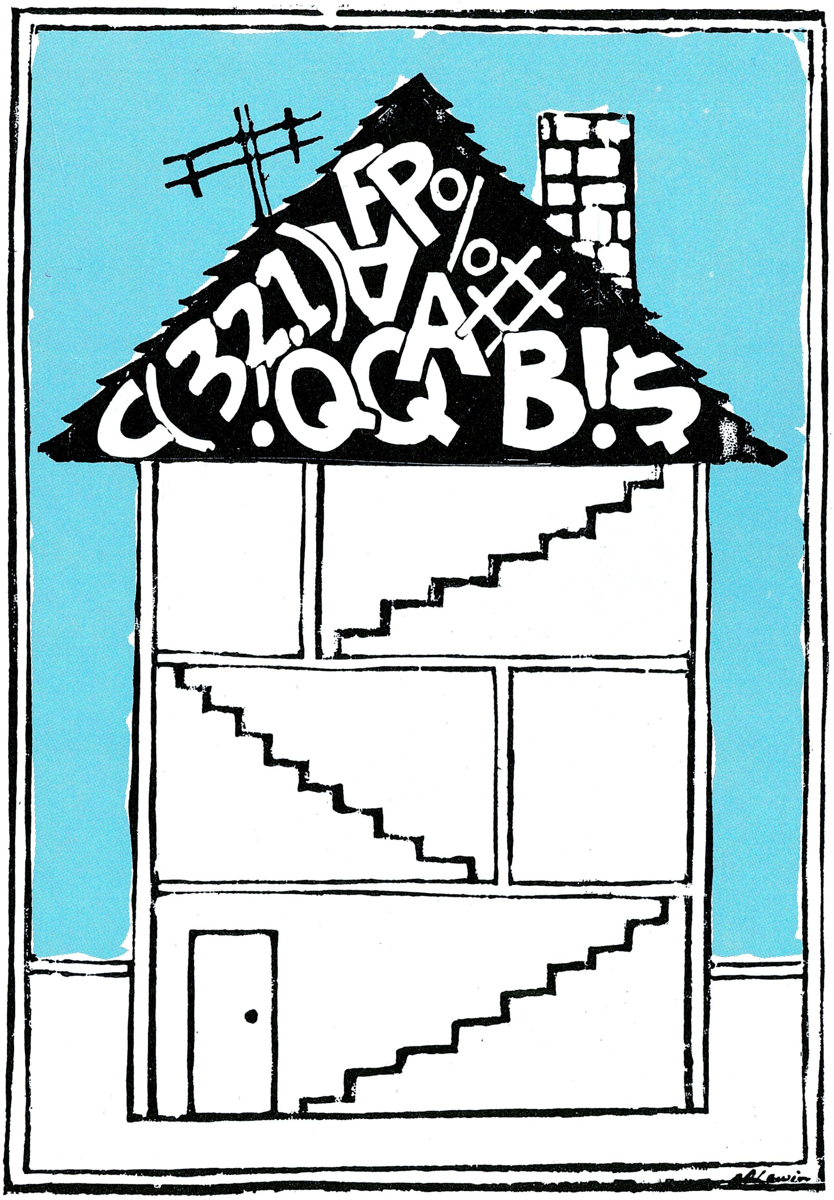
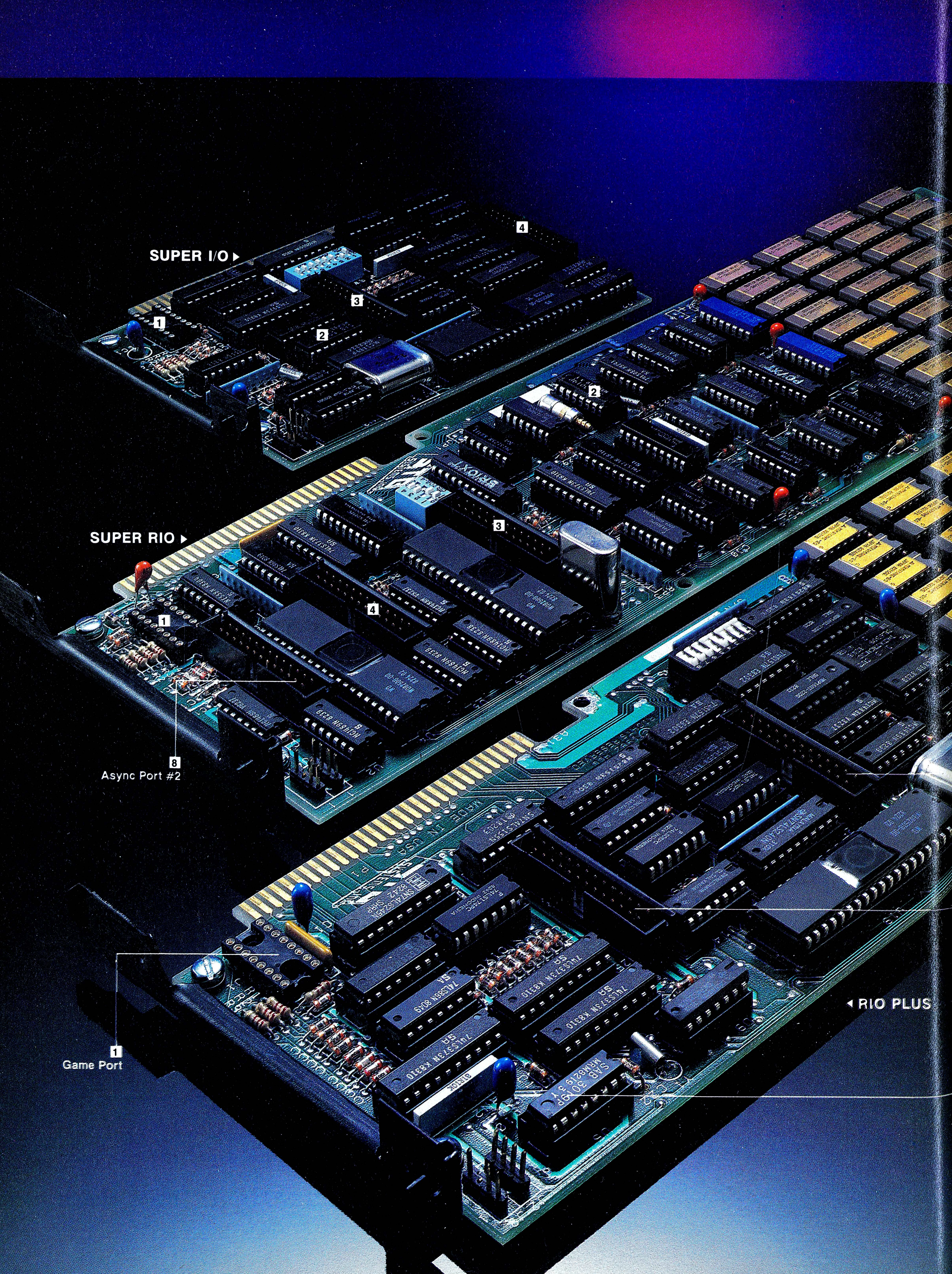


Illustration by Weldon O. Lewin

The study of the internal structure of IBM pc Basic can be very difficult and frustrating, because there's no source listing available to the general public. However, the study isn't totally futile; with the help of the DOS debugger, it's possible to produce an uncommented, unlabeled assembly listing of the Basic ROMs, and this listing, with some effort, can eventually be made intelligible.

Knowledge of the internal structure of Basic may be important to you for two main reasons. First, by analyzing the work of the professional programmers who wrote the language, you might develop better programming practices. Second, you can generally write much more elegant and efficient machine language routines for use in conjunction with Basic programs if your routines are able to call upon standard routines already stored in the Basic ROM; you can spare yourself the trouble of redeveloping the same code from scratch.

This article explains how IBM pc Basic keeps track of its variables during program execution. This information is not only intrinsically interesting, it should also be of great value to those who wish to manipulate Basic variables by calling an 8088 machine language subroutine.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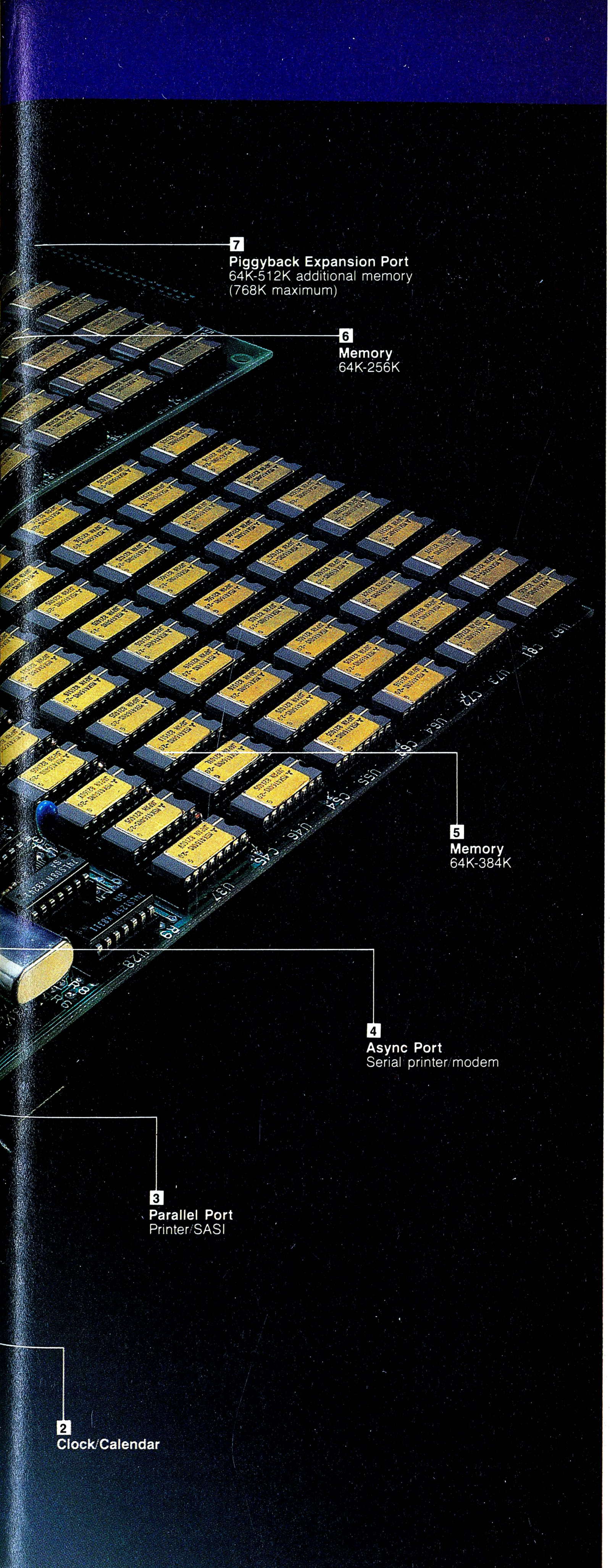

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IBM pc Basic, an implementation of Microsoft Basic, supports four variable types. There are three numeric types (integer, single-precision floating point, and double-precision floating point) and one alphanumeric type (string).

The Nature of Variables. Variable names can be up to forty characters in length and may be followed by an optional variable-identifier symbol. The symbol is used to indicate to the Basic interpreter the kind of variable being defined; the interpreter can thus do syntax checking and allocate the proper amount of storage space for the variable. The variable-identifier symbols are as follows:

Integer:	%
Single-precision floating point:	!
Double-precision floating point:	#
String:	$

If a variable identifier symbol is not used, the interpreter assumes by default that the variable is single-precision floating-point, unless the default has been overridden by one of Basic's *deftype* commands. These commands—*defint*, *defstr*, *defsng*, and *defdbl*—are used to declare all variables beginning with a specified letter (or with any of a group of specified letters) to be of a specified type. *Defint A*, for example, causes all variables beginning with the letter A to be of type integer; *defstr A-F* declares all variables beginning with the letters A, B, C, D, E, or F to be string variables.

When a variable is defined in a program, Basic stores its name and value in one of two memory areas just beyond the end of the program.

One area is reserved for simple variables (which are also called scalars) and for user-defined functions (those defined by means of Basic's *def fn* statement). This area is pointed to in memory by the contents of the address pair 358/359.

The second variable storage area is reserved for array variables and is pointed to by the contents of 35A/35B.

These addresses, incidentally, and all other addresses specified in this article, are expressed as hexadecimal offsets into Basic's data segment. To calculate the decimal value of a pointer, enter the *def seg* command with no parameters. This will select the current data segment. Then calculate _peek(&Hxxxx)+256*peek(Hyyyy)_, where xxxx represents the first (low) byte in the pointer pair and yyyy represents the second (high) byte.

Storage of Simple Variables. An entry in the simple variable area consists of two parts: a header, which contains the variable type and name, and the data, which contains the encoded value of the variable.

The header, which is the Basic interpreter's means of finding a variable during program execution, can occupy as few as four bytes of storage or as many as forty-two, depending on the length of the variable name (the length is specified by a "length" byte in the header). You can minimize storage space requirements by restricting your variable names to one or two characters. The memory allocation for each header is set forth in table 1.

Variable data for each simple variable is stored directly after the end of its header byte. The number of bytes required for the data is equal to the value of the type byte, which, as you'll see in table 1, means that integers take up two bytes, strings get three, and single- and double-precision variables require four and eight bytes respectively. The data for user-defined functions requires four bytes.

The value limits for each variable type are as follows:

Integer	**−32768 to +32767**
Single-precision	**+/− 2.9E−39 to 1.7E+38**
Double-precision	**+/−2.9D−39 to 1.7D+38**
String	**length of string may be 0 to 255 characters**
User-defined function	**Not applicable**

The data for integer variables is stored in two's-complement form and occupies two bytes; the low-order byte is stored first. The high bit of the high-order byte can be read to determine the sign of the number. If this bit is 1, then the number is negative; if it's 0, the number is positive.

The data for single-precision floating-point numbers is stored in four bytes. The first three bytes represent a signed mantissa, stored least significant byte first (see "How Basic Stores Numbers," *Softalk*, June 1983). The sign bit is the high bit of the third byte. The exponent is found in the fourth byte.

Data for double-precision floating-point numbers is stored in eight bytes. The first seven represent a signed mantissa, and, as in single-precision data bytes, the least significant byte comes first. The sign bit is the high bit of the seventh byte; the exponent is found in the eighth byte.

The data for string variables is stored in three bytes. The first byte represents the length of the string, and the next two bytes act as a pointer to the actual content of the string (the pointer's low byte is stored first). Strings are normally stored in the high end of memory, beginning at a location pointed to by 32F/330 and working downward to a location pointed to by 30A/30B. If, however, a string is explicitly defined within the program, Basic will conserve memory by pointing to this definition inside the program.

When a new string is defined or an old one is redefined, the new data is saved in such a way that the string's last byte lies where the 30A/30B pointer points to; that pointer is then adjusted so that it points to the byte immediately below the string bytes just stored. The superseded string data is not erased from memory, unless Basic has exhausted its string data space. If that does happen—if Basic runs out of room to store string data—it does what's called "garbage collection," which means it weeds out superseded definitions of current string variables and repacks the active definitions into the high end of memory.

The data for user-defined functions is stored in four bytes. The first two act as a pointer to the function definition within the program. The remaining two bytes appear to be unused.

Storage of Array Variables. The pointer at 35A/35B points to one byte past the end of the simple variable space. It also indicates the beginning of the array variable space. When a new simple vari-

Relative byte number (decimal)	**Number of bytes**	**Comments**
0	**1**	**This is the type byte, used to indicate what type of variable is being stored: 2 for integer, 3 for string, 4 for single precision, 8 for double precision.**
1,2	**2**	**These are the first two bytes of the variable name (in ASCII). The bytes are stored with their high bits off unless the variable is a function definition, in which case the high bit of the first byte is on. If the variable has only one character, the second byte is set to 0.**
3	**1**	**This is the length byte. It is set equal to the number of characters remaining in the variable name. It can take any value from 0 to 38.**
4...42	**0...38**	**These are the remaining bytes in the variable name, stored in ASCII with the high bit set. If the variable name is only one or two bytes long, then the length byte will be 0 and space for these bytes will not be allocated.**

Table 1. Memory allocation for simple variable headers.

able is defined, its header and data are stored beginning at this location, and the value of the 35A/35B pointer is adjusted appropriately. Before this occurs, however, the whole array variable area is moved up in memory, just enough to avoid being overwritten, and the end of the array variable pointer is adjusted appropriately.

The memory area for array variables begins immediately after the area used for simple variables and is pointed to by 35A/35B. The headers for array variables are identical in format to those for the corresponding types of simple variables.

The method used to store the data elements for each member of an array is also the same as for the corresponding type of simple variable. However, because of the nature of arrays, an additional series of bytes is required for the indication of the array's size. These additional bytes appear directly after the header.

The first two bytes in this series indicate how many bytes are required to hold the data for the entire array as well as the data for the number of and size of the dimensions. The number held in these two bytes (stored low byte first) provides an easy way for the Basic interpreter to calculate the address of the next array variable header.

Next comes a byte that indicates the number of array dimensions; this may be anything from 1 to 255. An array dimensioned as AB(1,5,3), for example, would have a value of 3 stored in this byte.

Following the byte that indicates the number of dimensions are pairs of bytes, each of which indicates the number of elements in an array dimension (dimensions may have up to 32,767 elements, so it takes two bytes to indicate the number of elements for each dimension). These are ordered so that the last dimension named in your Basic statement is indicated first and the first dimension is indicated last. The low byte is stored first in each pair. If *option base* equals 0, the number stored in these bytes will be the dimensioning number plus 1; if *option base* equals 1, the number stored will be equal to the dimensioning number.

Figure 1 shows the header bytes and dimensioning bytes for the array AB(3,5,2) with *option base* equal to 0.

After the dimensioning bytes come the actual data bytes for each array element. They are stored in exactly the same format as the data for simple variables of the corresponding type.

The array elements are stored in memory in such a way that the rightmost dimensioning index ascends most slowly. Thus, if an array is dimensioned as A(1,1), then A(0,0) is stored first, followed by A(1,0), A(0,1), and then A(1,1).

The pointer at 35C/35D points to one byte past the end of the array variable space. It also points to the beginning of Basic's free space. When a new array variable is defined, its header and data are stored beginning at this location and the value of the pointer is adjusted accordingly.

Basic Data Storage Pointers. We've referred to several pointers used by Basic to indicate the locations of important data areas. A list of twelve pointer locations, together with their descriptions, is given in table 2.

And finally, figure 2 is a generalized memory map of a Basic program, indicating the relative positions of the various data areas within the Basic data segment. Note that the absolute location of the start of the Basic data segment can be calculated from Basic by setting *def seg* to 0 and calculating the value of *16*(peek(&h510)+256* peek(&h511))*. ▲

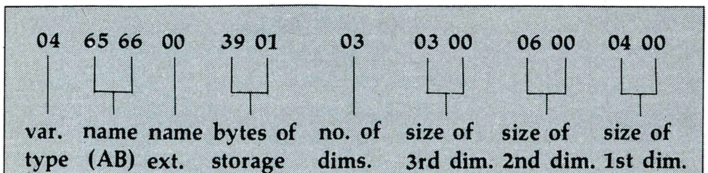

Figure 1. Header and dimensioning bytes for the array AB(3,5,2). *Option base* **equals 0.**

Pointer location (hex)	(decimal)	Description of pointer
02C	44	Bottom of the Basic stack. It can be set by means of the *clear* command.
02E	46	Line number of the line currently being executed.
030	48	Start of the Basic program.
30A	778	Top of string data space and top of free space. It can be set by means of the *clear* command.
32F	815	Bottom of string data space. Garbage collection occurs when an attempt is made to set this pointer below the value pointed to by the 35C/35D pointer.
345	837	The Basic stack pointer.
347	839	Line number of the last error.
356	854	End of the Basic program. This points to the 0 terminator in the last line of the program and is followed by 00 00, which will effectively halt a listing of the program.
358	856	Start of simple variables.
35A	858	Start of array variables.
35C	860	Start of free space. This normally points to one byte past the end of array variable storage.
35E	862	Location in memory from which the *data* will next be *read*.

Note: Memory locations given are offsets into the Basic data segment.

Table 2. IBM pc Basic pointer locations.

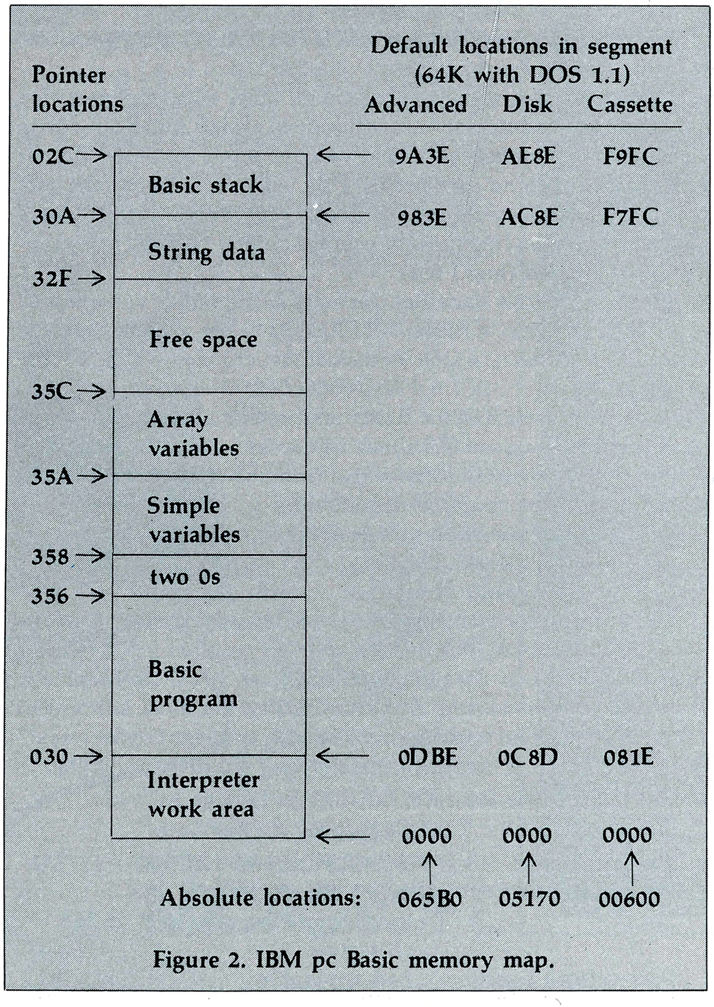

Figure 2. IBM pc Basic memory map.

Gary Little is a lawyer practicing in Vancouver, British Columbia; his specialty is computer law.

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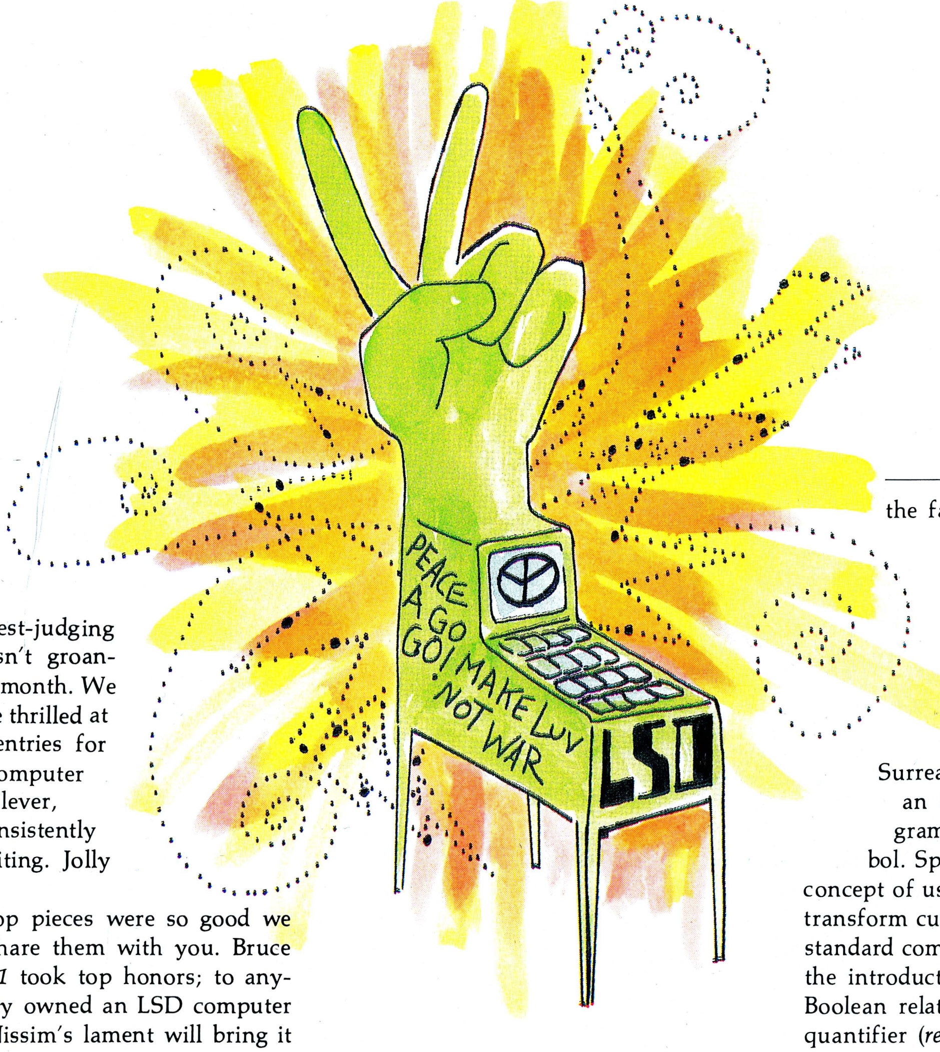

PEACE A GO GO! MAKE LUV NOT WAR
LSD

The contest-judging board isn't groaning this month. We couldn't be more thrilled at the quality of entries for April's Snob Computer essay contest. Clever, well-crafted, consistently professional writing. Jolly good job.

The three top pieces were so good we thought we'd share them with you. Bruce Nissim's *LSD/71* took top honors; to anyone who actually owned an LSD computer in the sixties, Nissim's lament will bring it all back.

The Dumpster, by Alan Weiner, speaks for itself. Everybody still has one out back of the old office. Didn't a company named Dempsey make a similar machine?

Now the *Miss Kitty*, that was some machine. Marie Oesting says it all in the shortest and sweetest way. Sad.

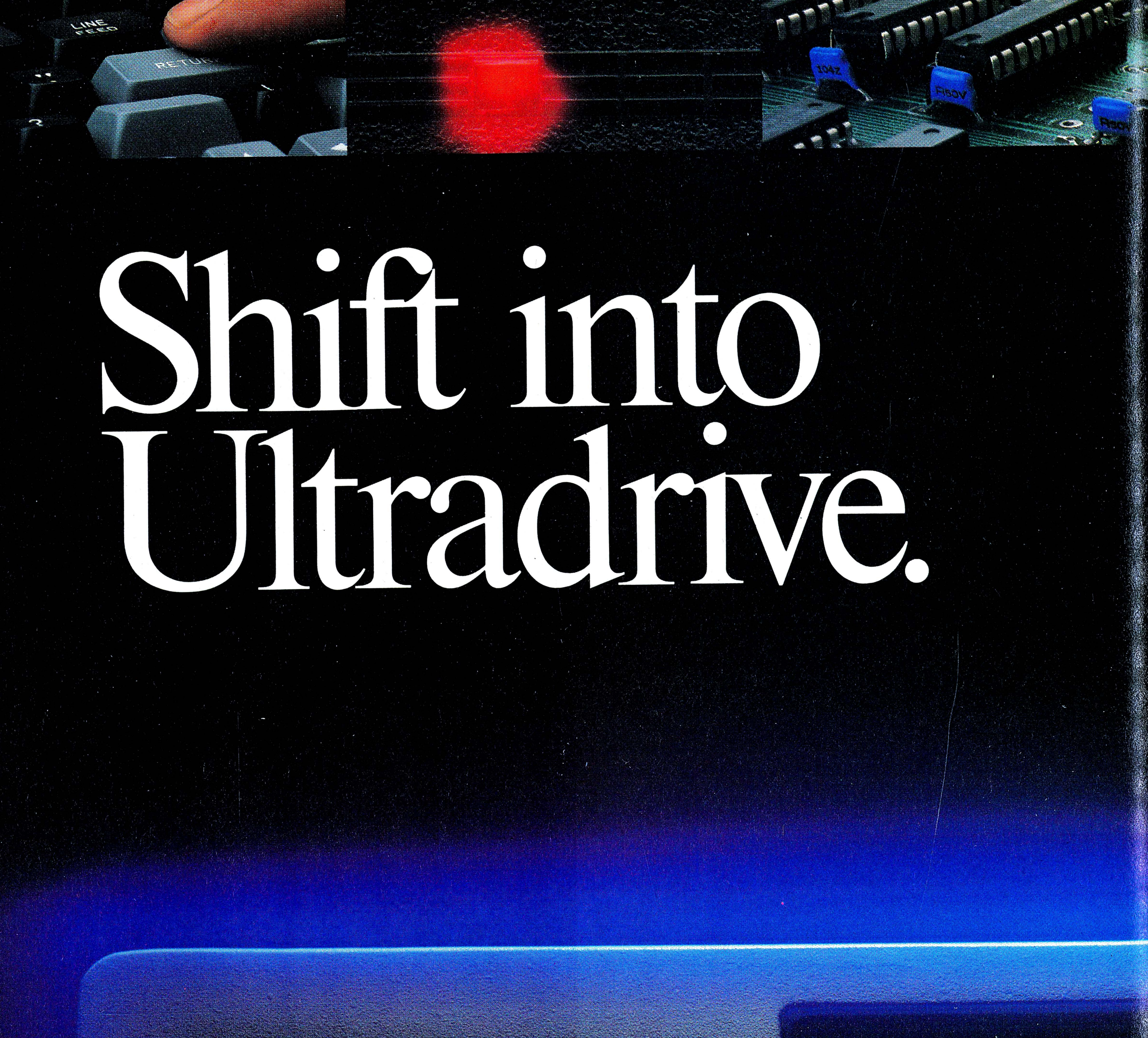
But funny. Your checks are in the mail, contest winners. Nissim gets $100, Weiner and Oesting, as runners-up, get fifty each. Go ahead and cry, all the way to your nearest dealer.

The LSD/71

Nineteen sixty-three marked the beginning of a new age: the age of free speech, free love, and LSD. We mean of course the LSD/71, a revolutionary new microcomputer from the Lightning Systems Division of Plastic Chemicals and Pharmaceuticals. At the time, PCP was enjoying a particularly strong cash flow (mostly in hundred-dollar bills); it developed the LSD/71 to capitalize on its market leadership in mind-expanding technology. As a target market, PCP chose the fastest-growing segment of the American consumer base, the functionally illiterate.

While justly credited for its pioneering efforts in state-of-the-art graphics, the LSD/71 is best remembered for its two software breakthroughs: SOS, the Surreal-time Operating System, and an advanced nonprocedural programming language called Speedbol. Speedbol virtually introduced the concept of user-friendliness. It attempted to transform current vernacular English into a standard computer syntax. It did so through the introduction of three new keywords: a Boolean relational operator (*like*), a virtual quantifier (*really*), and a postpositional declarative identifier (*you know*). A typical Speedbol expression might read *If A-Variable, you know, is like really high, then goto Winterland, else get stoned and watch Laugh-In.*

PCP was also well ahead of its time in marketing and production techniques. Its products were packaged in bright Day-Glo colors and assembled in low-cost labor markets outside the United States. Each model developed a loyal following, and it was not unusual to overhear on college campuses a heated argument over the relative merits of



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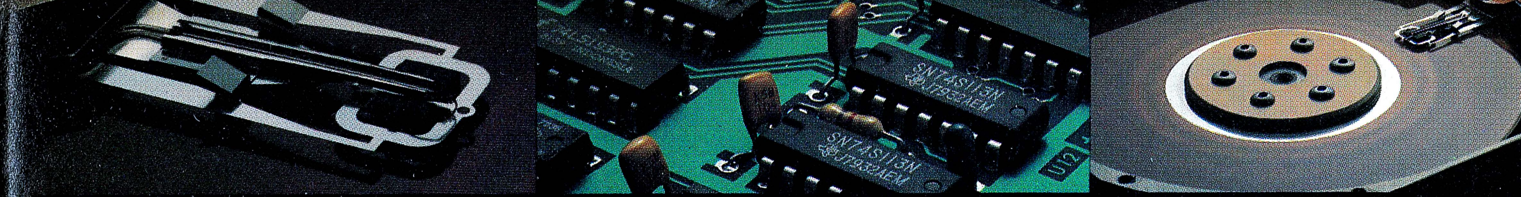

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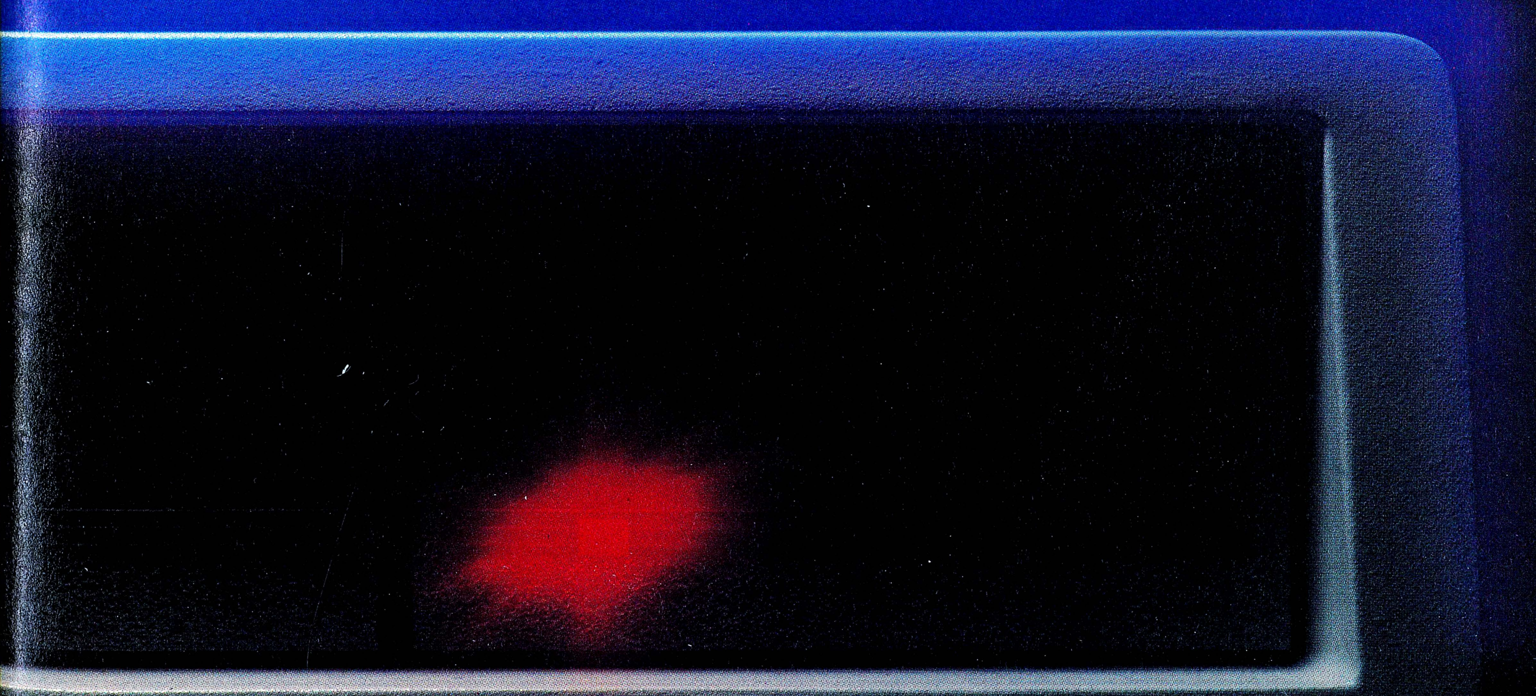

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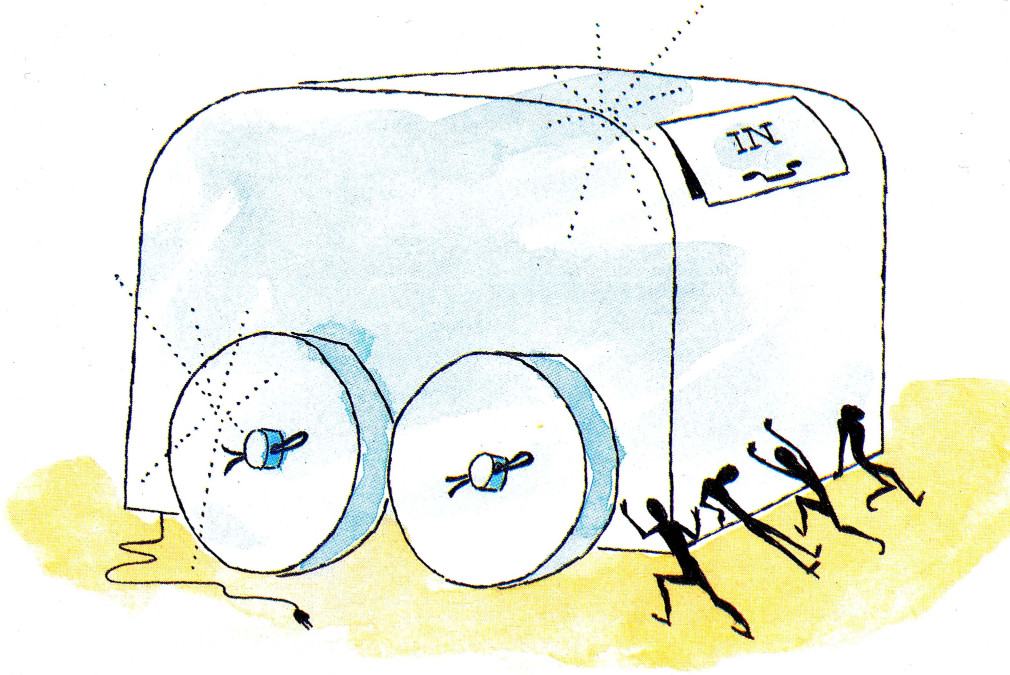


Panama Red versus Columbia Gold. In fact some of those arguments can still be heard today.

PCP also pioneered the concept of unbundling, choosing to sell memory by the kilo, a technique well established in its existing dealer network.

Despite the substantial popularity it enjoyed, the LSD/71 eventually foundered. Users began complaining of head crashes, bad vibrations, and a peculiar display glitch called a flashback.

Of the three principal developers of the LSD/71, two were last reported living in Costa Rica. The third is currently studying for an MBA at Stanford Business School.

Bruce Nissim
San Francisco, CA

The Dumpster

The Dumpster entered the home computer market with great fanfare. Advertisements announced that the Dumpster's CPU was "A Real Chip—just like the chips used in big computers!" The 150-pound machine sat on four stainless-steel wheels, and Aurora claimed it was portable "in any unilevel environment." The Dumpster was guaranteed at the factory with twenty-four-hour burnout, and it boasted a revolutionary new feature—a gigabyte of write-only memory.

The Dumpster ran into problems from the start. Users quickly found that although there was ample storage they could not retrieve any information they had fed into the Dumpster. Aurora advised them to input only data that was no longer needed. Users who followed this approach coined the now-famous term, "Garbage In." Users also had trouble seeing characters on the Dumpster's sleek, ultramodern white-on-white monitor, and had to wear sunglasses while programming. The limits of the machine's portability were also a source of dissatisfaction. Although the Dumpster could be easily pushed and pulled by four strong men, it consistently listed to the right and would not navigate corners. It also would not fit through a standard doorway. So the Dumpster stayed in the room in which it was assembled, accumulating waste data and taking up space.

Although Dumpsters are still being used in many government agencies, Aurora was forced to take the machine off the home market. People quickly discovered that they had purchased what amounted to an electronic circular file and the Garbage In computer became Garbage Out.

Alan Weiner
Wheaton, MD

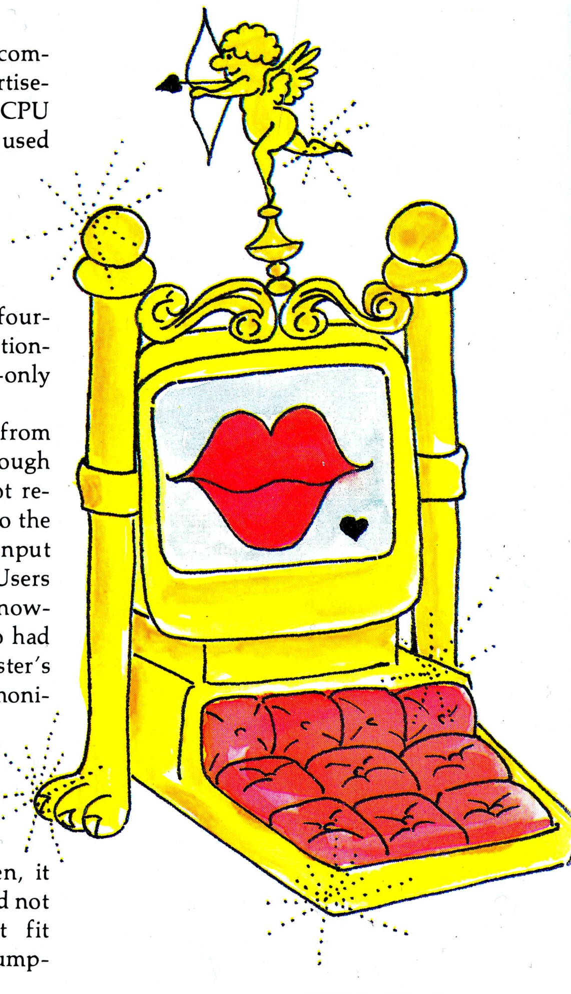
The Miss Kitty

Best computer I ever owned was the Miss Kitty. It was made somewhere in Kansas by an old retired gent. Called himself Doc Adams.

Now, that was a pretty machine. No clown suit and a single rose, no sir. The keyboard was decked out in solid red silk with a matching red-and-black-silk-striped monitor cover. No use for a mouse with the Miss Kitty. You just stroked the keyboard with a genuine ostrich plume.

Fine machine. I'd still be using it today except some gun-toting maniac put a .45 through it one day. Claimed the program had been canceled.

Marie Oesting
Baraboo, WI



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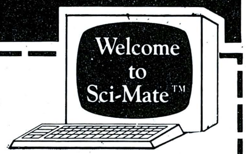

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MATHEMATICS MADE EASY(er)

A Father Helps with the Homework

by Jean Varven

When Joseph Barteck of Tucson, Arizona, began working on a math drill and practice program to run on the Personal Computer, he wasn't concerned about publishing the program or making a profit. Rather, this IBM employee and father of six was motivated by something much closer to home—the fact that his youngest daughter, seven-year-old Katrina, was falling behind in math and needed tutoring in order to keep up. One of Barteck's aims in writing the program was to help his daughter help herself.

Joseph Barteck, daughter Katrina, and their pc take the mystery out of math.

Both father and daughter experienced success. Barteck wrote *Math Tutor*—a comprehensive, expandable program designed to help people improve their addition, subtraction, multiplication, and division skills—and Katrina, who began using the program regularly at home, managed to bring her math skills up to speed. In fact, reports her father, she is now performing a year ahead of grade level.

Understandably, Barteck is proud of his daughter and pleased to have been able to do something that made a difference in her life. He's also gratified by the fact that friends who were impressed with the program suggested to him that he try to get it published.

Barteck decided to follow his friends' advice. Publishing *Math Tutor*, he reasoned, would mean that other kids and adults who needed help with math would have access to the program and that he might realize some financial return on his efforts. With these possibilities in mind, Barteck worked to perfect and polish the program. When the synopsis he wrote drew IBM's interest, he packed the enhanced version of the program off to the division in Boca Raton that handles employee submissions. He did not send it elsewhere, however; as an IBM employee, he is not allowed to submit a program to any competing companies.

Now for the somewhat frustrating aspect of this story. The submissions group considered *Math Tutor* for seven months (the usual reporting time for employee submissions is two or three) before Barteck got the word: It's a good program, said the evaluators, and we found no bugs in it; the only problem is that we don't think there is sufficient profit to be made in publishing it. The day after Barteck received his rejection notice, IBM announced plans to publish two other math programs.

Because he is employed by IBM, Barteck cannot send *Math Tutor* elsewhere in hopes of making a profit from its publication, despite the fact that it seems to have proven itself an effective, versatile teaching tool. What he can do is to make the program available anyway, by releasing it to the public domain; that way, people who need help in math will profit from his work, even if he doesn't.

Now for the Good News. A disk version of *Math Tutor* is being offered to interested *Softalk* readers for a nominal charge of $8. Since the software is in the public domain, readers are free to make as many copies of it

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as they like. Any money Barteck would ordinarily have made from this arrangement will be donated to a child-abuse-prevention group.

Written in Basic, *Math Tutor* is designed to run on pcs that have at least 48K. The program can be used by students in each of the elementary grades as well as by older students who need math practice. Because of the way the program is set up, it can generate millions of different recallable tests and exercises. It can also change as your child's needs and skills change, and it can be used with more than one child at a time.

When a learner indicates that he would like to work on some math exercises or a math test, he is asked his name and grade level so that appropriate problems can be generated; this process takes about one second. Then he is presented with a series of problems (twenty-five is the default here; the number of problems can be varied in either direction by altering the appropriate program parameter).

The movement of a flashing cursor then prompts the user to solve problems digit by digit. Barteck has done a particularly nice job on this aspect of the program; the cursor movement exactly duplicates the sequence that would be followed in solving the problem on paper. If a child is doing a multiplication problem, for example, the cursor is positioned at the right and moves to the left as numbers are entered; it then moves back toward the right again but properly aligned one space over for the next phase of the problem. At the end of the problem series, an opportunity to solve missed problems is given.

Barteck has made *Math Tutor* essentially self-documenting. From the main menu, pressing a single number key will get you instructions and information about the program itself, the keyboard setup, and how to work problems. You can also find out about tests and exercises, test analysis, and how to create special types of problems.

Math exercises and tests for the six elementary grades are already stored on disk. In addition, parents and teachers can vary parameters, using the program to create tests and exercises that are personalized in format, type, bounds, sequence, time, and duration (exercises include a time-limit feature). Since program "setups" are derived from stored data, changing the problems is simply a matter of changing certain parameters.

The program can be used to meet the tutorial needs of six students at one time. Since the disk is copyable, you can (and should) make a backup of the original and use it as your working copy. This also means, of course, that you can store tutorial sequences for different groups of six students on different copies of the original disk.

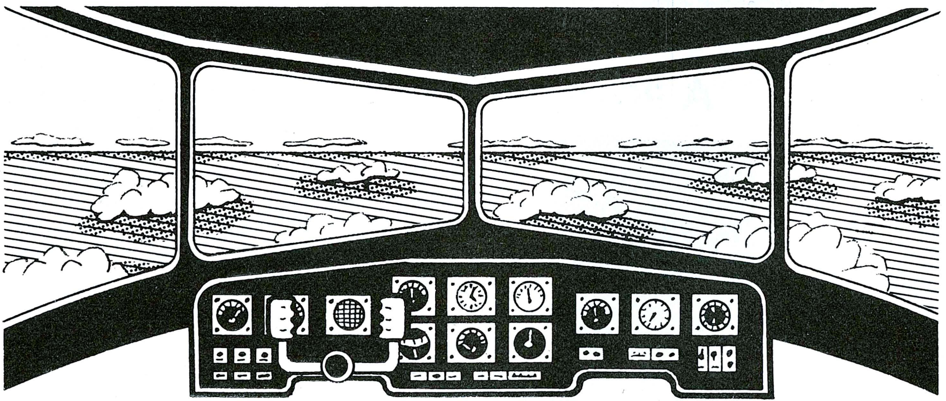
Learning to interpret and use the program setup information and the format grid into which you enter parameter changes may take a little time. But once you've worked with the program a bit, you're likely to wonder why these things ever gave you any trouble.

Shapes of Things To Come. Barteck came to IBM six years ago after more than twenty years in the Air Force in the nuclear weapons field and two years studying electronics at TVI, a technical school in Albuquerque, New Mexico. Four or five of those Air Force years were spent teaching about such subjects as nuclear weapons, quality control, electronics, and management. Two years ago, he joined IBM's General Products Division in Tucson. His recent work at IBM has taken place in what he describes as "a laboratory-type environment in future printer products." He can say that the group is involved in "building things that might come out in the future," but he can't say what these things are. One example of a product that came out of this environment is a supremely speedy high-end printer that's capable of making more than two hundred copies a minute and more than one million copies a month.

In February of last year, Barteck bought a Personal Computer for home use through IBM's employee discount program. He'd taken a class in Fortran at the technical school but hadn't had any experience with a home computer. Before long, though, he'd taught himself to program in Basic. *Math Tutor* is his first program.

As Barteck tells it, he didn't really have any other programs in mind as models; he had simply set out to write something his daughter could use to exercise her math skills. Mainly, he wanted to create "a program that would be helpful when a student was having difficulty with a particular type of problem." Therefore, he set things up so that the parent or teacher has control over the tutorial situation and can vary the types, formats, and elements of problems as necessary to help a particular student master a specific skill. His own experience has shown that when you're trying to develop a new skill, repetition is one of the best teachers, and so the program can be set up to test for the same skill or set of skills over and over.

"The program just kind of grew as I continued to put in nifty things I wanted to see if I could do," says Barteck. One of the first things he did was to obtain information from his daughter's school about the national and state school standards for the various grade levels so that he could incorporate them into his program exercises and end-of-year tests. These standards tell teachers and parents



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what types of problems a child must be able to solve successfully in order to be promoted to the next grade. By the same token, a student who can correctly work the *Math Tutor* end-of-year problems in the time allotted should be ready to move on to the next year's math challenges.

When he did start looking at various other math programs on the market, Barteck was surprised to discover that none of them allowed a problem to be worked on the screen in the same way as on paper. Instead, most programs required that the student work a problem out on paper and then simply enter the answer. One of his first requirements for his own program was that it allow working of all problems on-screen exactly as they would be done on paper.

Barteck also discovered that some math programs on the market don't allow learners to make corrections when they realize they have accidentally hit a wrong key. Barteck felt that a math program had to permit learners to make these kinds of corrections, so he set his program up to allow them to do so. Then, in testing out an early version of the program on his own children, Barteck learned that the cursor movement involved in making corrections was difficult for them. They were spending a good deal of their time trying to correlate the arrow keys and the cursor movement, which meant that the problem-solving process became harder and more time-consuming than it otherwise might have been. Therefore, in what he describes as "the trickiest part of the program," Barteck deactivated the cursor movement arrow keys and designated the letter key C as the cursor correction key. Hitting C moves the cursor back one space, making the correction process much easier.

Beat the Clock. Another program element to which Barteck gave special attention was the time factor. His program is set up to keep track of how much time it takes a learner to press the enter key after a problem first comes on the screen. When a child sets out to work a problem, three outcomes are possible—*correct, correct but out of time,* and *wrong, the answer is. . . .* But since none of these messages is given until the enter key is pressed, a learner is not placed under time pressure. "If it takes them an hour to answer it," says Barteck, "let them answer. Then let them go back and critique it."

Barteck goes on to explain why he felt it was important to incorporate a time feature. "An average student can answer a certain kind of problem within a certain time limit. The problem with most tests is that there are some problems you can do fast and there are some that take longer. If each problem itself has a time limit, you have a truer indication of how the student is doing."

With *Math Tutor* finished and its fate decided, the Barteck family pc is far from idle. Two of Barteck's high-school-age children, Stacey and Donna, also use *Math Tutor*, and everyone in the family enjoys playing various games, including a *Star Wars*-type program created by some friends. Barteck himself continues to get a lot of personal satisfaction from programming in his spare time; he usually spends ten to fifteen hours a week enjoying his hobby. At present, he's working on some home management software. In these programs, as in his first, user-friendliness is a primary concern. He feels that this element is sorely lacking in much of the software he has seen. As to whether he will submit another of his programs to IBM, Barteck says he hasn't decided. At this point, he's more concerned with creating a useful program than he is with what may or may not happen to it later on.

To obtain a copy of *Math Tutor*, send $8 to Math Tutor, Softalk for the IBM Personal Computer, Box 60, 11160 McCormick Street, North Hollywood, CA 91603. Please allow a few weeks for delivery. ▲

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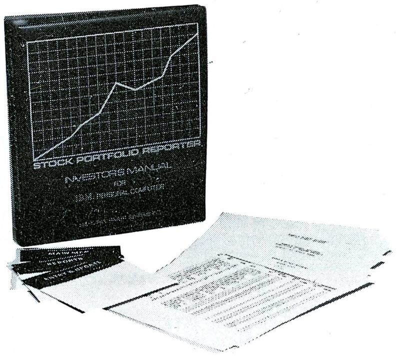

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FROM SCREEN TO DUMP IN ALMOST 60 FLAT

by Chris Lindell

One feature of the IBM Personal Computer causes both pain and pleasure. To produce a fine graphics display requires patience and mathematical skills. The pain comes from trying to print a screen image in high-resolution display mode.

The first requirement for printing high-resolution screen images is that you have the color/graphics display adapter and a suitable monitor. The second requirement is a printer that handles hi-res graphics—such as the Epson MX-80 with Graftrax or the IBM Personal Computer printer.

IBM Advanced Basic has some powerful statements—such as *get*, *draw*, *line*, and *paint*—for handling graphic images. These commands, however, are designed for quick interaction with images on the screen, not on the printer.

This article presents a high-resolution screen dump program. It's yours to type in and use as you see fit. If you don't want to type it in yourself, you may send eight dollars to Softalk Dumpscrn, Box 60, North Hollywood, CA 91603, and you'll receive it on disk in the mail (allow a few weeks for processing). The disk will include the programs in figures 1 and 2, along with the assembly source listing and an impressive graphics image.

The background of this program is as follows. First an attempt was made to write a high-resolution screen dump in Basic. The approach taken was to *get* an 8-by-640-point matrix from the screen, make the calculations for which pins needed to be fired, and then send a line out to the printer. It worked, but it was a little obnoxious. It took twenty-two minutes to print one screen.

The next attempt was to access the memory location directly from a Basic program rather than use the *get* statement. A significant improvement resulted, but ten minutes was still a long time to wait for a screen to print.

The only way to achieve satisfactory speed was to write the program in assembly language. The Basic program shown in figure 1 loads the high-resolution print screen machine language code and saves it on disk. Any Basic program may then use a *bload* state-

```
90 DEF SEG = &H1700
100 FOR I% = 0 TO 168         'LOAD THE SUBROUTINE
110 READ J%
120 POKE I%,J%
130 NEXT
140 DEF SEG = &H1700:BSAVE
    "DUMPSCRN",0,&HA9         'SAVE THE SUBROUTINE
150 END
160 DATA &H55
170 DATA &H06
180 DATA &HEB,&H05,&H90
190 DATA &H00,&H00
200 DATA &H80
210 DATA &H80
220 DATA &HBA,&H00,&HB8
230 DATA &H8E,&HC2
240 DATA &HB4,&H05
250 DATA &HB2,&H1B
260 DATA &HCD,&H21
270 DATA &HB2,&H41
280 DATA &HCD,&H21
290 DATA &HB2,&H08
300 DATA &HCD,&H21
310 DATA &HB9,&H0C,&H00
320 DATA &HB2,&H20
330 DATA &HB4,&H05
340 DATA &HCD,&H21
350 DATA &HE2,&HF8
360 DATA &HB2,&H1B
370 DATA &HCD,&H21
380 DATA &HB2,&H4C
390 DATA &HCD,&H21
400 DATA &HB2,&H80
410 DATA &HCD,&H21
420 DATA &HB2,&H02
430 DATA &HCD,&H21
440 DATA &HB9,&H50,&H00
450 DATA &H2E,&H8B,&H1E,&H05,&H00
460 DATA &H2A,&HD2
470 DATA &H26,&H8A,&H37
480 DATA &H2E,&H22,&H36,&H07,&H00
490 DATA &H2E,&H84,&H36,&H07,&H00
500 DATA &H74,&H05
510 DATA &H2E,&H02,&H16,&H08,&H00
520 DATA &H2E,&HF6,&H06,&H08,&H00,&HAA
530 DATA &H75,&H07
540 DATA &H81,&HEB,&HB0,&H1F
550 DATA &HEB,&H05,&H90
560 DATA &H81,&HC3,&H00,&H20
570 DATA &H2E,&HD0,&H0E,&H08,&H00
580 DATA &H73,&HD2
590 DATA &HB4,&H05
600 DATA &HCD,&H21
610 DATA &H2E,&HD0,&H0E,&H07,&H00
620 DATA &H73,&HC0
630 DATA &H2E,&HFF,&H06,&H05,&H00
640 DATA &HE2,&HB9
650 DATA &HB2,&H0A
660 DATA &HB4,&H05
670 DATA &HCD,&H21
680 DATA &H2E,&H81,&H06,&H05,&H00,&HF0,&H00
690 DATA &H2E,&H81,&H3E,&H05,&H00,&H40,&H1F
700 DATA &H75,&H85
710 DATA &HB2,&H1B
720 DATA &HCD,&H21
730 DATA &HB2,&H40
740 DATA &HCD,&H21
750 DATA &H2E,&HC7,&H06,&H05,&H00,&H00,&H00
760 DATA &H07
770 DATA &H5D
780 DATA &HCB
```

Figure 1.

ment, as demonstrated in figure 2, to print a high-resolution screen in slightly over sixty seconds. The routine is designed to be loaded once by a Basic program, and then it may be called as many times as needed.

One way the routine can be incorporated into a program is by means of a function key. The following lines allow you to hit function-key 10 whenever you want to print a high-resolution screen:

```
10 KEY 10,"":KEY (10) ON     'SET UP FUNCTION KEY 10
20 ON KEY (10) GOSUB 2000 'TO PRINT A HI-RES
                             SCREEN
30 DEF SEG = &H1700
40 BLOAD"DUMPSCRN"           'LOAD MACHINE
                             SUBROUTINE
   .
   . remainder of Basic program
2000 REM *** KEY 10 PRESSED — PRINT HI-RES SCREEN
2010 WIDTH "LPT1:",255
2020 SUBRT% = 0
2030 CALL SUBRT%
2040 RETURN
```

The assembly source listing for the machine code is shown in figure 3. This source code is documented to explain how the printing is done.

```
10 REM   be prepared, this program takes close to an hour to
         draw the image
20 REM
30 SCREEN 2:KEY OFF:CLS  'draw an impressive graphics
                          image
40 P=300:Q=90:XP=250:XR=1.5*3.1415927#:YP=56:YR=
   1:ZP=64:XF=XR/XP:YF=YP/YR:ZF=XR/ZP:FOR
   ZI=-Q TO Q-1:IF ZI<-ZP OR ZI>ZP THEN GOTO 70
50 ZT=ZI*XP/ZP:ZZ=ZI:XL=INT(.5+SQR(XP*XP-
   ZT*ZT)):FOR XI=-XL TO XL:XT=SQR(XI*XI+
   ZT*ZT)*XF:XX=XI:YY=SIN(SIN(XT)+.4*SIN
   (3*XT))*YF
60 X1=XX+ZZ+P:Y1=-YY+ZZ+Q:PSET(X1,Y1):NEXT XI
70 NEXT ZI
80 DEF SEG = &H1700         'print out the screen, takes
                             about 1 minute
90 BLOAD "DUMPSCRN"
100 WIDTH "LPT1:",255
110 SUBRT% = 0
120 CALL SUBRT%
130 END
```

Figure 2.

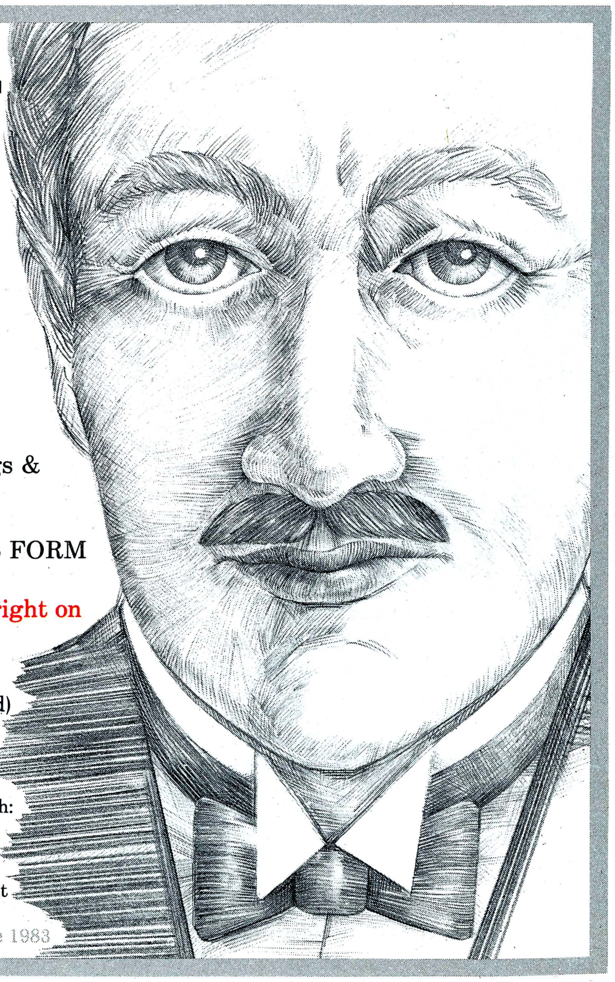
```
                                     PAGE
                                     COMMENT *

                           TITLE:    DUMPSCRN
                          AUTHOR:    Christopher J. Lindell
                            DATE:    July 1983
                         PURPOSE:    This program will allow 640 X 200 resolution screens to be dumped to
                                     the printer. The printer must be an Epson MX-80 fitted with Graftrax+
                                     or the Epson MX-100. The screen will be centered on an 8 1/2-by-11
                                     piece of paper. The routine will reset the printer to turn on conditions
                                     when printing of the screen is complete. *
                                     PAGE
0000                        CSEG     SEGMENT STACK
                                     ASSUME CS:CSEG,ES:NOTHING
0000                       SUBRT     PROC  FAR
0000 55                              PUSH BP                 ;SAVE BP
0001 06                              PUSH ES                 ;SAVE ES
0002 EB   05   90                    JMP START               ;JUMP OVER DATA
0005 0000                 MEMVAL     DW 0000H                ;STARTING MEMORY OFFSET
0007 80                   BITPOS     DB 10000000B            ;BIT POSITION WITHIN BYTE
0008 80                   LINVAL     DB 10000000B            ;LINE 0-7 MASK
0009 BA   B800            START:     MOV DX,0B800H           ;BEGINNING SEGMENT
000C 8E   C2                         MOV ES,DX               ;LOAD INTO SEGMENT REGISTER
000E B4   05                         MOV AH,5H               ;AH=5 SIGNAL PRINT FUNCTION ON INTERRUPT 21
0010 B2   1B                         MOV DL,1BH              ;ASCII CHARACTER 27
0012 CD   21                         INT 21H                 ;SEND TO PRINTER
0014 B2   41                         MOV DL,41H              ;MOVE "A" TO THE PRINTER
0016 CD   21                         INT 21H                 ;PRINT IT
0018 B2   08                         MOV DL,8H               ;MOVE OUT LINES PER INCH
001A CD   21                         INT 21H                 ;PRINT IT
001C B9   000C            AGAIN:     MOV CX,0CH              ;12 BLANKS
001F B2   20                SPC:     MOV DL,20H              ;PRINT 12 BLANKS TO CENTER
0021 B4   05                         MOV AH,5H               ;AH=5 SIGNALS INTERRUPT
0023 CD   21                         INT 21H                 ;GO DO THE PRINT
0025 E2   F8                         LOOP SPC                ;DO IT TWELVE TIMES
0027 B2   1B              GRPHS:     MOV DL,1BH              ;PRINT ASCII 27
0029 CD   21                         INT 21H
002B B2   4C                         MOV DL,4CH              ;PRINT L
002D CD   21                         INT 21H
002F B2   80                         MOV DL,80H              ;PRINT 128
0031 CD   21                         INT 21H
0033 B2   02                         MOV DL,2H               ;PRINT 2
0035 CD   21                         INT 21H
0037 B9   0050                       MOV CX,50H              ;80 POSITIONS
003A 2E:  8B   1E   0005 R MAIN:     MOV BX,MEMVAL
003F 2A   D2                         SUB DL,DL               ;ZERO OUT DL—WILL BE PINS TO FIRE
0041 26:  8A   37          LPT1:     MOV DH,ES:[BX]          ;LOAD BYTE FROM SCREEN
0044 2E:  22   36   0007 R           AND DH,BITPOS           ;MASK IT
```

```
0049  2E:  84   36    0007  R                 TEST DH,BITPOS           ;SEE IF EQUAL
004E  74   05                                 JZ  LP3                  ;JUMP IF ZERO
0050  2E:  02   16    0008  R                 ADD DL,LINVAL            ;ADD LINE VALUE IF BIT WAS THERE
0055  2E:  F6   06    0008  R AA        LP3:  TEST LINVAL,10101010B
005B  75   07                                 JNZ  LP4                 ;JUMP BACK AND FORTH IN MEMORY
005D  81   EB   1FB0                          SUB BX,1FB0H             ;THIS COMES BACK FOR ODD LINES
0061  EB   05   90                            JMP ERYOTH               ;JUMP OVER EVEN MEMORY OFFSET CALCULATION
0064  81   C3   2000                    LP4:  ADD BX,2000H             ;EVEN LINES CALCULATIONS
0068  2E:  D0   0E    0008  R        ERYOTH:  ROR LINVAL,1             ;ROTATE PIN VALUE
006D  73   D2                                 JNB LPT1                 ;SEND OUT WHEN ALL 8 PINS ARE CALCULATED
006F  B4   05                                 MOV AH,5H                ;CODE 5 TO AH FOR THE INTERRUPT
0071  CD   21                                 INT 21H                  ;GO PRINT
0073  2E:  D0   0E    0007  R                 ROR BITPOS,1             ;ROTATE MASK RIGHT 1
0078  73   C0                                 JNB MAIN                 ;JUMP IF DONE WITH BYTE
007A  2E:  FF   06    0005  R                 INC MEMVAL               ;GET THE NEXT BYTE
007F  E2   B9                                 LOOP MAIN                ;DECREASE CX , DO IT 80 TIMES (BYTES)
0081  B2   0A                                 MOV DL,0AH               ;LINE FEED AFTER A WHOLE LINE
0083  B4   05                                 MOV AH,5H                ;CODE 5 TO AH FOR THE INTERRUPT
0085  CD   21                                 INT 21H                  ;GO DO THE PRINT
0087  2E:  81   06    0005  R 00F0            ADD MEMVAL,0F0H          ;INCREMENT TO NEXT LINE
008E  2E:  81   3E    0005  R 1F40            CMP MEMVAL,1F40H         ;LAST MEMORY LOCATION TO QUIT ON
0095  75   85                                 JNZ AGAIN                ;DO IT AGAIN IF NOT DONE
0097  B2   1B                                 MOV DL,1BH               ;PRINT ASCII 27
0099  CD   21                                 INT 21H                  ;GO PRINT
009B  B2   40                                 MOV DL,40H               ;RESET PRINTER TO DEFAULT VALUES WITH "@"
009D  CD   21                                 INT 21H                  ;GO PRINT
009F  2E:  C7   06    0005  R 0000            MOV MEMVAL,0000H         ;RESET MEMORY VALUE FOR THE NEXT TIME
00A6  07                                      POP ES                   ;RESTORE ES
00A7  5D                                      POP BP                   ;RESTORE BP
00A8  CB                                      RET 00H                  ;FAR RETURN TO BASICA
00A9                                   SUBRT  ENDP
00A9                                    CSEG  ENDS
                                              END
```

Figure 3.

▲



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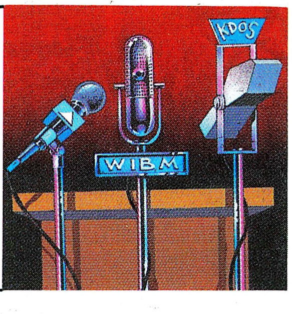

Unless otherwise indicated, software listed runs in DOS on machines with either display adapter and requires 64K and at least one disk drive.

Δ **SubLogic** (713 Edgebrook Drive, Champaign, IL 61820; 217-359-8482) has announced *Night Mission Pinball*, by Bruce Artwick, a "simulation so real you can tilt the machine." Has the look and sound of a real table. Game's theme is World War II night bombing run. With ten modes of play, including cosmic, slow motion, and high speed. Create and save up to one hundred custom modes of your own design. Requires color/graphics adapter. $39.95.

Δ Enjoy more sound and music: an External Speaker enhancement has been created by **Soft Solutions** (419 Pierce Street, Suite 6, San Francisco, CA 94117; 415-626-8088). Features variable volume and on/off control. $39.95. Δ *PC Commander* is a depth charge arcade game. Run the deadly North Sea straits mined by a German wolf pack. $29.95. Δ Eleven full-length classical masterpieces show off tonal quality in *PC Music Box*. $29.95.

Δ Two extensions to *WordStar* from **CMB3 Enterprises** (1412 Gatewood Court, Martinez, CA 94553; 415-372-7733): *WS-Patch* enables five different character sets to print in a variety of styles and densities. *WS-Keys* allows you to redefine the ten function keys of any command sequence or word. Keys: $24.95. Both: $39.95.

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Δ A point-of-sale, inventory management, and business accounting system, *The Retailer*, is available from **Retail Solutions** (1211 Alderwood, Sunnyvale, CA 94086; 408-734-0653). For stores requiring two cash registers, the program controls pricing at the registers, maintains perpetual inventory records, and simultaneously runs any of the system's accounting packages. Requires 192K, hard disk, and communications adapters. $4,950.

Δ Two utilities from **Systemathica Consulting Group** (4732 Wallingford Street, Pittsburgh, PA 15213; 412-621-8362): *DOSX-1* offers optimized disk I/O buffering for high-performance processing. $100. Δ *DOSX-2* offers an optimized large-scale mass storage buffering system. $100.

Δ *Opportunities and Pitfalls '83* is an annual review of the computer industry, held in two-day-seminar form in various cities throughout the country. Notebook of entire presentation and model of industry on disk included as part of the package. Call **Future Computing** (900 Canyon Creek Center, Richardson, TX 75080; 214-783-9375) for locations and dates. $795.

Δ *PFS:Write* is a word processor that integrates with all other *PFS* programs and reads text-file output from most other software. Simple and easy to learn. Comes with function key template, on-screen help, and quick-reference command guide. From **Software Publishing Corporation** (1901 Landings Drive, Mountain View, CA 94043; 415-962-8910). $140.

Δ More than one hundred seventy-five hints and answers to various Interlogic adventures, printed in invisible ink, are contained in each illustrated *InvisiClues* booklet from **Zork Users Group** (Box 20923, Milwaukee, WI 53220). $9.95 each; specify game. Δ Illustrated eleven-by-seventeen-inch fold-out guide maps for *Zork I, II,* and *III* are printed in brown and black ink on parchment tone paper. $2.95 each; specify game. Δ Architectural drawings of the Robner mansion and grounds may help unearth clues for *Deadline* aficionados. $2.95. Δ Guide map for *Starcross* reveals the ins and outs of the alien craft. $2.95.

Δ A high-performance, three-pen plotter has been introduced by **Mannesmann Tally** (8301 South 180th Street, Kent, WA 98032; 206-251-5645). The Pixy lets single commands generate circles, spirals, opened or closed curves, and expand or contract one or both axes of a graph. Memory includes ASCII set, Greek, special scientific characters, and nine international language sets. With parallel interface, $795; serial, $880. Δ The MT 180L is a fifteen-inch-carriage, letter-quality printer, capable of 132 columns for spreadsheet, accounting, and report preparation. Compressed printing option allows up to 264 lines. Lightweight, cast-aluminum construction. $1,098. Dot-matrix 108I model: $998.

Δ A full-scale critical path project management system from **North America MICA** (11772 Sorrento Valley Road, San Diego, CA 92121; 619-481-6998), called *PMS-II*, prints activity reports with extensive sorting and data-selection options, standard Gantt or bar charts, graphic and tabular funding schedules, and more. Package satisfies all mandatory and optional governmental requirements. Requires CP/M-86. $1,295.

Δ **Software Building Blocks** (Box 119, Ithaca, NY 14851; 607-272-

2807) has released a two-pass, locally optimizing Pascal compiler. Based on the Pascal/Z compiler, the *SBB Pascal* implementation closely follows the Jensen and Wirth definition of the language, with professional programming extensions added. Includes debugging and editing functions. $350.
Δ Written with a farmer's needs in mind, the *Farm Ledger* from **Harvest Computer Systems** (203 West Eleventh Street, Alexandria, IN 46001; 317-724-9527) handles income, expenses, notes, and open accounts. The package also features check writing, checkbook balancing, comparison of performance to projection, and more. $250. Δ *Field Manager* is a field record database that keeps a detailed history of each field's production, including soil tests, yields, and costs. Enter crop costs directly from *Farm Ledger*. $350. Δ *Dairy Journal* is a production and profitability analysis system for dairy herds. Handles up to one thousand cows and provides ranking reports, production test results, lactation summaries, and more. $600.
Δ Key Tops is a set of four enlarged keys that slip over existing enter, tab, and shift keys. Easily applied. Key names are stamped into nonglare plastic. Color matches keyboard. From **Applied Dynamics** (Box 1810, Cottonwood, AZ 86326; 602-634-7148). $18.95.
Δ Version 2 of *MBA* from **Context Management Systems** (23864 Hawthorne Boulevard, Torrance, CA 90505; 213-378-8277) incorporates telecommunications and custom forms capabilities with business graphics, financial analysis, word processing, and data management. $695. Δ An extended service agreement policy guarantees updates to future releases at no cost. $150 per year.
Δ **Source Telecomputing** (1616 Anderson Road, McLean, VA 22102; 703-734-7500) has begun SourceNet, its own telecommunications network, in metropolitan Washington, D.C., New York City, and Pleasantville/White Plains, New York. Metropolitan Chicago and Philadelphia are scheduled for summer. When using SourceNet, subscribers to the Source need only dial a local number and hit two carriage returns to access the database service.
Δ *EdCompCon '83* is an educational computing conference to be held October 18–20 at the Red Lion Inn in San Jose, California. Application of the latest technologies to education is the primary focus. Hardware, software, and systems exhibits, demonstrations, and seminars included. Sponsored by the **IEEE Computer Society Technical Committee on Computers in Education** (1109 Spring Street, Silver Spring, MD 20910; 301-589-8142). $10 to $85. Δ *Educational Computer* magazine (Box 535, Cupertino, CA 95015) features current happenings from special education to in-service training. Columns focus on preschoolers, library media specialists, administrators, IEEE Technical Committee news, software reviews, instructional advice, and more. Fifteen dollars per year until September, then $25.
Δ A comprehensive time and billing software system for attorneys, accountants, architects, consultants, and service agencies has been introduced by **State of the Art** (3183-A Airway Avenue, Costa Mesa, CA 92626; 714-850-0111). May be integrated with the company's general ledger module. $795.
Δ **Tallgrass Technologies** (11667 West Ninetieth Street, Overland Park, KS 66212; 913-492-6002) has announced a twenty-megabyte streaming-cartridge-tape backup device for the XT. Can stream data or selectively back up and restore. $2,195. Forty-five-megabyte version: $2,495. Δ Two high-capacity, high-performance hard disk drives have thirty-five- and seventy-megabyte capacity respectively. $5,595 and $6,595. Δ Price reductions on the Winchester standalone hard disk and hard disk systems with integral tape backup have been announced. See your dealer.
Δ The Hard Disk III Subsystem from **VR Data** (777 Henderson Boulevard, Folcroft, PA 19032; 215-461-5300) includes case, power supply, cables, and mounting hardware, fully assembled, tested, and burned in. Available as five-megabyte fixed and/or five-megabyte removable disk cartridge. Ten- and fifteen-megabyte configurations available. $995.

Big Blue Releases 8087 Math Chip

You can now fill that empty socket next to the 8088 processor on the main circuit board with a genuine IBM-approved part: Big Blue has finally announced the availability of the 8087 math coprocessor chip.

The 8087 is a microprocessor in its own right. It differs from the 8088, which is designed for general-purpose tasks, in that its internal hardware is tailored to perform various math operations at very high speed and with great precision. One disadvantage: In order to use the 8087's capabilities, programs designed specifically for the coprocessor are required. With the coprocessor now available from IBM, it's likely that such programs will be forthcoming. Some software, such as Microsoft's recently announced Business Basic (see page 122), already supports the coprocessor.

The 8087 is available as part of a kit, which also includes an 8088 chip. IBM's inclusion of the 8088 in the kit, a result of the company's determination to make sure the two chips "match," is yet another indication of the company's conservative design philosophy. The IBM Product Center price of the option kit is $260.

IBM has also announced two new languages, APL and Logo. APL is widely used in the teaching, research, math, and science communities. Through an asynchronous communications line, pc APL is capable of exchanging workspaces and data files with an APL system running on an IBM 370. The IBM Product Center price is $195.

Logo is an interactive language highly regarded for its ability to develop problem-solving skills and introduce mathematical, geometric, and programming concepts. Written by Logo Computer Systems, the new language will be available in the fourth quarter. It will carry a price tag of $175 at IBM Product Centers.

Other new offerings from Big Blue include *Computer File-Command, One Hundred and One Monochrome Mazes*, a manual entitled "LearningTo Use DOS 2.0," and *Private Tutor. Private Tutor* allows an instructor to design computer-guided lessons. By itself, *Private Tutor* will be available for $50. IBM will also be offering several courses to be used in conjunction with *Private Tutor*, including "Learning DOS 2.0," "Multiplication Tables," and "Learning To Program in Basic."

Δ *The One-Key Step-Scroller* for Basic Programmers replaces the *list* command and steps through programs (forward or backward) or repeats the same lines. Other features included. From **IRC Associates** (125 Sherrfield Drive, Saginaw, MI 48603; 517-792-2156). $15.
Δ An automatic six-pen version of the Model 200 graphics plotter has been released by **Strobe Graphic Systems** (897 Independence Avenue, Building 5A, Mountain View, CA 94043; 415-969-5130). The Strobe 260 features automatic pen changing and preselection of colors. Pen-change routine is automatically invoked during plotting. Includes RS-232 interface. $995.
Δ Two new modules in the EasyBusiness Systems family have been announced by **Information Unlimited Software** (Oakmead Terrace, 1230 Oakmead Parkway, Sunnyvale, CA 94086; 408-746-0911). *Order Entry* and *Inventory Control and Analysis* can function as standalones or integrate with other modules. $595 each.
Δ *Data-Timer* is a billing, time-records, and analysis program for sorting and organizing services performed and other source data from *Day-Timer Diary*. Both programs from **Wayne Green** (Elm Street, Peterborough, NH 03458; 800-258-5473). The package features instant access to client records, password protection, personalized disk system, and more. $295.

Δ The Series 500 optical character recognition system from **Caere** (100 Cooper Court, Los Gatos, CA 95030; 408-395-7000) incorporates a circuit board with an attachable wand reader for remittance processing, inventory control, and point-of-sale use. Custom programmable; a string of up to eighty characters is recognized. XT version available. $1,145.

Δ Quick and easy transfer of data to the DEC VAX or PDP-11 is now available using *Dash-I Schematic Designer*, emulation software from **FutureNet** (21018 Osborne Street, Canoga Park, CA 91304; 213-700-0691). The pc is converted into a workstation that automates circuit and schematic design of systems composed of ICs and discrete components. Software, proprietary graphics controller, extra memory, and a mouse are included in the package. $5,980. Δ *VTerm* allows emulation of a VT-100 terminal. Scientific data captured by *Dash-I* is easily transferred to the DEC mainframe for processing and pass-along to other CAD/CAM systems. $200.

Δ **Cyborg** (55 Chapel Street, Newton, MA 02158; 617-964-9020) has announced the Isaac 2000 networking system that teams an onboard Motorola 68000 microprocessor with the pc for fast data acquisition, enhanced memory capacity, and multitasking capabilities previously unavailable. Up to fourteen Isaac 2000s can be supported by one host computer. Burst sampling rates of up to 200 kHz can be attained, with a twelve-bit A/D resolution. A number of twelve- or sixteen-bit analog interfaces and binary input/output options are available. $4,000.

Δ A desk of solids and veneers made by **Computer Furniture** (Box 2663, Chapel Hill, NC 27514; 919-967-8104) features a sliding (and lockable) keyboard tray, a shelf for the system unit, and a floppy disk drawer that hold seventy-four disks vertically. The only component actually on the desk is the screen. Walnut, $595; oak, $525.

Δ A package that combines word processing, financial planning, and simple database management has been released by **Peachtree Software** (3445 Peachtree Road N.E., Atlanta, GA 30326; 404-239-3000). *PeachText 5000* is said to have features comparable to those of *WordStar*, *SpellStar*, *MailMerge*, and *VisiCalc*. Spreadsheet function compatible with *PeachCalc*. $395.

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Δ Computer Listings of Employment Opportunities is a bulletin-board service aimed at technical professionals seeking career changes. Jobs listed can be applied for on-line. The database was created by Copley Press, a West Coast newspaper chain. Contact **CLEO** (2164 West 190th Street, Torrance, CA 90504; 213-618-0200). Service is free.

Δ The hard-disk version of the *Metamorphics Insurance System*, a full-functioned agency management system for independent insurance agents that includes accounting, prospecting, and marketing, is available from **Metamorphics** (Two Balsa Plaza, Bala Cynwyd, PA 19004; 215-668-9000). $3,650. Color XT version, $4,000.

Δ Written by a practicing attorney specializing in wills and trusts, *Personal Lawyer/Wills*, from **Lassen Software** (Box 1190, Chico, CA 95927; 916-891-6957), is a question-and-answer session that generates a will to dispose of property under applicable local state laws. Beneficiaries of general or specific gifts may be named. Requires eighty columns and printer. $50.

Δ An indexing system, a note editor, an alarm clock, a programmable calculator, a phone dialer, hard-copy control, and disk-management facilities are all part of *The Desk Organizer*, personal business software from **Conceptual Instruments** (4730 Warrington Avenue, Philadelphia, PA 19143; 215-726-7856). Requires eighty columns and two disk drives. $250.

Δ Combining the best features of other popular Logos, *PC-Logo*, from **Harvard Associates** (260 Beacon Street, Somerville, MA 02143; 617-492-0660), has a Lisp-based design for easy and powerful language extension. Features programmable function keys and enhanced editing capabilities. $199.95.

Δ For anyone interested in buying and selling fixed-income investments, *Fixed-Income Securities Calculations* calculates yield and price for such instruments as municipal bonds, United States Treasury and Federal Agency issues, corporate bonds, and certificates of deposit. From **Momentum Software** (533 Sutter Street, San Francisco, CA 94102; 415-982-7375). $185.

Δ *Plumb—Probing the World of Personal Telecommunications* is a newsletter designed to help users explore the many services available via modem. Published by **Riverside Data** (Box 300, Harrods Creek, NY 40027; 502-228-3820), the publication lists hundreds of private- and company-sponsored databases and systems, as well as electronic mail, software sales and exchange, and on-line games. $20 for five issues.

Δ A 16K to 64K buffer for Epson MX or FX serial printers has been introduced by **Wesper Microsystems** (14321 New Myford Road, Tustin, CA 92680; 714-730-6250). The Wizard EBI-Serial interface enables you to dump print data nonstop into the buffer and proceed to your next task. Installation is simple. $216.

Δ *S3E (Steady State Systems Engineering)* is a power plant and chemical process simulator that performs sophisticated flowsheet analysis tasks. From **PSI/Systems** (Research Park, Box 3100, Andover, MA 01810; 617-475-9030). $1,360. Individual application Paks start at $50.

Δ *PC Pal*, from **Comprehensive Software** (2316 Artesia Boulevard, Redondo Beach, CA 90278; 213-318-2561) uses games, sound, and animation to teach learners about their computers. Requires double-sided drive and eighty columns. $39.95

Δ **Legend Industries** (2220 Scott Lake Road, Pontiac, MI 48054; 313-674-0953) has introduced the TR-1M RAM card. The card will support up to 768K of directly addressable RAM in either 64K or 256K segments. Maps around already used spaces in the pc's memory. Price to be announced.

Δ Two new *TK!SolverPaks* from **Software Arts** (27 Mica Lane, Wellesley, MA 02181; 617-237-4000): The *Mechanical Engineering Pak* features thirteen models—including cantilever beam, cylindrical wall heat transfer, and natural frequency of vibration in rotational systems; each contains the necessary equations and values for solving specific problems. Modules are modifiable. $100. Δ *The Financial Management Pak* includes thirteen models covering such topics as compound interest calculation, cost of equity capital, and bond refunding decisions. For use by financial analysts and managers. $100. Δ The first issue of *TK!SATN*, the journal for *TK!Solver*, has been released. The bimonthly publication teaches how to make best use of the number-manipulation package. $50 per year.

Δ A book and software combination, *The Executive's Guide to the IBM Personal Computer*, is a complete introduction to business applications and programming in Basic. Written for the reader with a basic knowledge of simple business transactions; two disks show how actual systems run. Published by **Reston Publishing** (11480 Sunset Hills Road, Reston, VA 22090; 703-437-8900). $39.95.

Δ Electronic mail software from **Software Connection** (1800 Wyatt Drive, Santa Clara, CA 95054; 408-988-3704) now supports the pc on a Corvus Omninet. *Mail Monitor* allows more than sixty workstations on an Omninet to send letters, files, and other data to each other. Letters can be addressed to specific workstations or general distribution list; printer can be shared. $950.

Δ Four stock-option programs for stock brokers and individual investors have been released by **Star Value Software** (12218 Scribe Drive, Austin, TX 78759; 512-837-5498). *Optionvue-A* and *Optionvue-B* are "what if?" spreadsheets, the B version covering more advanced strategies. $189 each. Δ *Opvalu* and *Advanced Opvalu* are designed to aid investors in determining the fair market value of put and call options. $39.95. Advanced version: $129.

Δ A system for the entry, editing, processing, and presentation of questionnaire data, *The Survey System* from **Creative Research Systems** (1864 Larkin Street, San Francisco, CA 94109; 415-771-0912) can produce crosstabs, scored variable tables, and bar charts camera-ready for presentation. Tables can be up to three pages long in banner format. Weighting of questionnaires and selection of subsamples are among the editing capabilities. Requires 128K. $495.

Δ *HyperTyper* is a typing aid for offices, schools, and homes. From **Digital Marketing** (2363 Boulevard Circle, Walnut Creek, CA 94595; 415-938-2880), the package can be used for typing tests and practice drills. Children can use it as a game. $49.95.

Δ A two- and three-dimensional, fully interactive, color and black-and-white graphics program, called *Energraphics*, can do business graphics as well as computer-aided architectural and engineering design. Rotation of objects, zooming, and hidden line removal are possible. Three-dimensional surfaces and functions can be plotted, viewed, and analyzed statistically. From **Enertronics Research** (150 North Meramec, Saint Louis, MO 63105; 314-725-5566). Requires graphics adapter. $250. Δ Five building energy savings, economic, and design programs for use by architects, designers, builders, and energy auditors are available. Overhand is a solar utilization program. $95. Δ *Pasode 1* is a correlation model for designing and assessing passive solar energy savings. $295. Δ *Lifecost* is a complete life-cycle cost analysis program. $295. Δ *Bill* constructs a building's energy usage by correlating utility bills with local weather. $295. Δ *Insulate* determines the economically optimum insulation thickness of any building surface. $295.

Δ An AC standby power system designed to prevent loss of power and data due to utility company line problems, RBS-AC monitors power from a wall outlet and eliminates spikes with a transient suppression system. Switches to backup battery power during interruptions. From **Control Technology** (8200 North Classen Boulevard, Oklahoma City, OK 73114; 405-840-3163). Overseas 50 Hz. −240 VAC unit is also available. $569.

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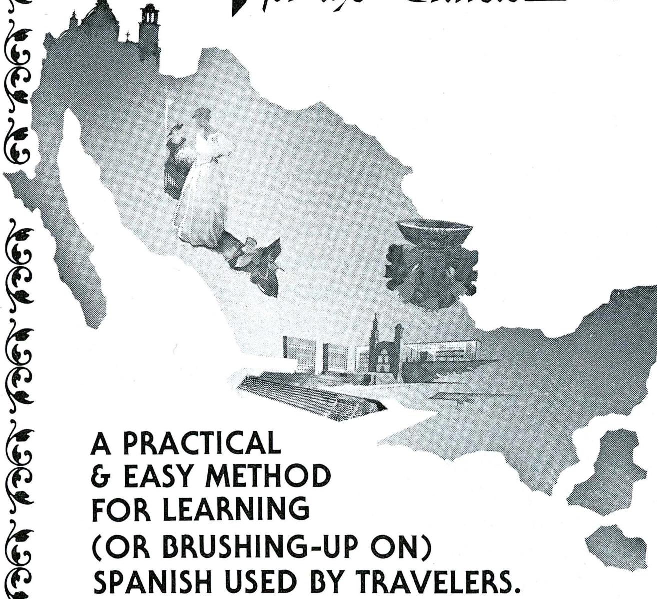

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Δ Intelligent communication between a pc and an IBM mainframe is possible with *OmniLink* software from **On-Line Software International** (Fort Lee Executive Park, Two Executive Drive, Fort Lee, NJ 07024; 800-526-0272). Spreadsheets, forecasting, analysis, or accounts receivable and payable can now be done without specially written programs for each task. Works with *OmniCom* electronic mail software. Packaged with *OmniMicro*, an applications generator and query language program. $28,000 for DOS systems. $35,000 for OS.

Δ Two hard disks that feature high-speed streaming-tape-cassette backup have been announced by **Sysgen** (47853 Warm Springs Boulevard, Fremont, CA 94539; 415-490-6770). The Sysgen II-10 provides ten megabytes of storage, the II-20 provides twenty. Backup is performed at 2.5 megabytes per minute; both systems can be configured in up to ten logical volumes. Works under PC-DOS or CP/M-86. II-10, $2,995; II-20, $3,795. Δ A twenty-megabyte streaming cassette backup subsystem for the XT includes controller, drive electronics, and tape drive. Image performs complete archival backup at a rate of 2.5 megabytes per minute. Two backup modes. $995.

Δ Telemarketing tasks are automatically organized, scheduled, and facilitated using the *PCat System* from **Arlington Software+Systems** (97 Bartlett Avenue, Arlington, MA 02174; 617-641-0290). Stores client data, schedules lists of calls, handles various kinds of dialing, does calculations and word processing. Applications include fund-raising, subscription soliciting, telephone surveying, retail and wholesale marketing, and more. Requires 128K, eighty columns, and modem. $680.

Δ Plot and process data and curves described by mathematical functions with *Plot!*, available from **Non-Linear Products** (Box 14755, Minneapolis, MN 55414). Switch back and forth between linear, semilog, and double-log scales to calculate and plot inverse, power, and linear functions of the data points. Labels can be placed anywhere on a graph. $29.95.

Δ Libraries, schools, scholars, teachers, and writers: compile, format, and arrange bibliographies using *The Personal Bibliographic System* from **Personal Bibliographic Software** (Box 4250, Ann Arbor, MI 48106; 313-996-1580). Includes screen editor, variable-length fields and records; allows notes and annotations. Punctuation of annotations is according to ANSI and ISO standards. Requires eighty columns, two disk drives, and printer. $250.

Δ *SuperCalc*, *1-2-3*, and *dBase II* training programs have been added to the Startup training series from **Computer Labs of America** (9340A Clairmont Mesa Boulevard, San Diego, CA 92123; 619-576-1133). Each program includes a series of thirty-minute video tapes, outlines, and data disks. $60 each.

Δ A printer buffer from **Interactive Structures** (146 Montgomery Avenue, Bala Cynwyd, PA 19004; 215-667-1713) makes it possible to compose, insert, and rearrange information on its way from the program to the printer. Using random-access printing, PipeLine makes it possible to compose letters or reports in building-block fashion. Comes with its own plug-in power supply. Memory is expandable. Requires parallel interface. 8K: $230. 128K: $440.

Δ Instant (nondelayed) stock options are now available with *PC Quote*, a software and communications package from **On-Line Response** (327 South LaSalle Street, Chicago, IL 60604; 800-225-5657). Besides quotes, the system provides more than thirty months of history on stocks listed on the five major exchanges. Generates charts, analyzes positions for options traders, handles tax accounting, and more. $495. Quotation fees and database line charges are billed.

Δ The Prototype/Decoder board provides the means to interface prototype circuitry quickly. From **Real Time Devices** (Box 906, State College, PA 16801), it features a switch-selectable address decoder that frees the experimenter to concentrate on design. Four I/O device-select input and output signals, four power supply voltages, and a buffered bus are available. $99.

Δ **Software Libraries** (Box 844, Pasadena, CA 91102; 213-793-1700) has announced a correspondence and text module, *The Business Library Word Processor*. Can function as a standalone or integrate with the other nine Business Library Modules. $495.

Δ *VisiCalc* templates for the small medical practice are available from **CMA** (55722 Santa Fe Trail, Yucca Valley, CA 92284; 619-365-9718). Private patient bills and AMA claim forms can be printed. Requires 96K. $249.95.

Δ The latest developments from **Tecmar** (23600 Mercantile Road, Cleveland, OH 44122; 216-464-7410): The PC-Mate Lab Master board provides sixteen channels of fast hi-res analog-to-digital conversion, two channels of twelve-bit digital-to-analog conversion, and more. $995. Δ The PC-Mate IEEE-488 interface is for applications involving IEEE-488 protocol. $395. Δ The ComNet Office Communications System, based on the Ethernet expansion board, allows networking, electronic mail, dictating machine control, and more. Available in three configurations: The Secretary; The Manager, with modem; and The Executive, with modem and voice recognition included. $1,695 to $2,995. Δ Five versions of mass storage in a minicabinet package include ten-, fifteen-, and twenty-six megabyte formatted storage; five-megabyte removable-cartridge Winchester; and a 6.25-megabyte multiple floppy stack drive, recommended for backup on hard disk systems. $1,595 to $3,395. Δ The 2ndMate expansion board provides two serial ports, two parallel ports, clock/calendar, and more. $295. Δ The 3rdMate multifunction board offers a 300-baud direct-connect auto-answer modem, serial and parallel ports, battery-powered real time clock/calendar, and more. $445. Δ *Speech Master* hardware and software provides synthetic voice output, text-to-speech conversion, and expanded native vocabulary. Board, $395; support package, $95. Auxiliary vocabulary unit: $100. Δ A PC-DOS 2.0 update for the Winchester Expansion product line is available to previous customers. $25. Δ New slimmer ORBs (option retaining brackets) for the XT will be provided for all customers at no cost.

Δ **Executec** (12200 Park Central Drive, Dallas, TX 75251; 214-239-8080) has introduced *The Business User's Solution*, a set of integrated applications including *Execu/Writer*, a word processor; *Execu/Model*, a spreadsheet; *Execu/File*, for data management; *Execu/Plot*, for graphics; *Execu/Reporter*, for formatting and printing; *Execu/Link*, a 3780 emulator; and a utility package. Standardized formats, data sharing, and modular addition are features of system. From $450 to $1,500, depending on modules selected.

Δ The menu-driven *Fast Graphs* will compare up to six sets of data on a single graph—bar, pie, or scatter. From **Innovative Software** (9300 West 110th Street, Overland Park, KS 66210; 913-383-1089); the package features a draw mode for complete editing of graphs and charts. Characters, shadowing, circles, boxes, and arcs can all be added. $295.

Δ *PC Weighmate* is an electronic postal, shipping, and counting scale system that gives you instant USPS, Federal Express, and UPS rates, tells you the least expensive way to go, does parts counting, and more. From **Micro General** (1929 S.E. Main Street, Irvine, CA 92714; 714-557-3744), the system comes with a twenty-five-pound-capacity electronic scale platform, interface board, and software. $695.

Δ Utilities from **Quest** (Box 2553, Huntsville, AL 35804; 205-533-9405): *QuesTalk* is an asynchronous communications program that allows you to select baud rate, parity, duplex, and more. $110. *PrintPak* is a general-purpose printing utility. $45.

Δ *DietCalc* calculates your ideal weight, the number of calories you need every day, the length of time to get to that weight and more. From **Savant Software** (Box 440278, Houston, TX 77244; 713-556-8363). $24. ▲

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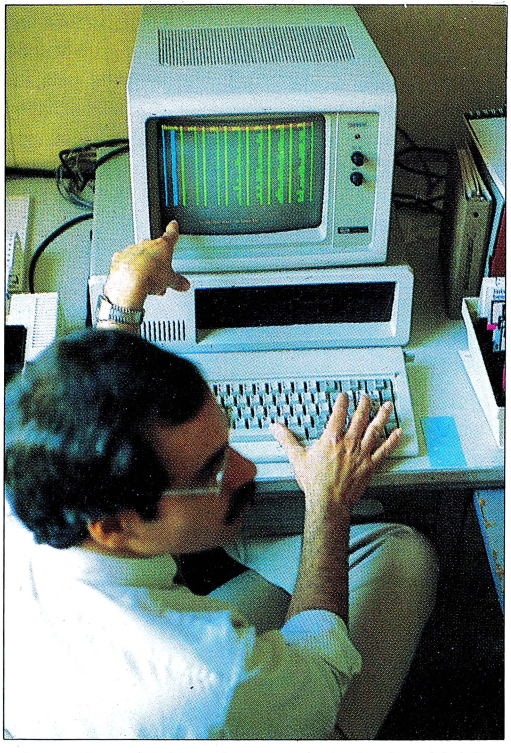
by Michael Ferris

SOFTWARE PHYSICIANS

PCs Join the Johns Hopkins Staff

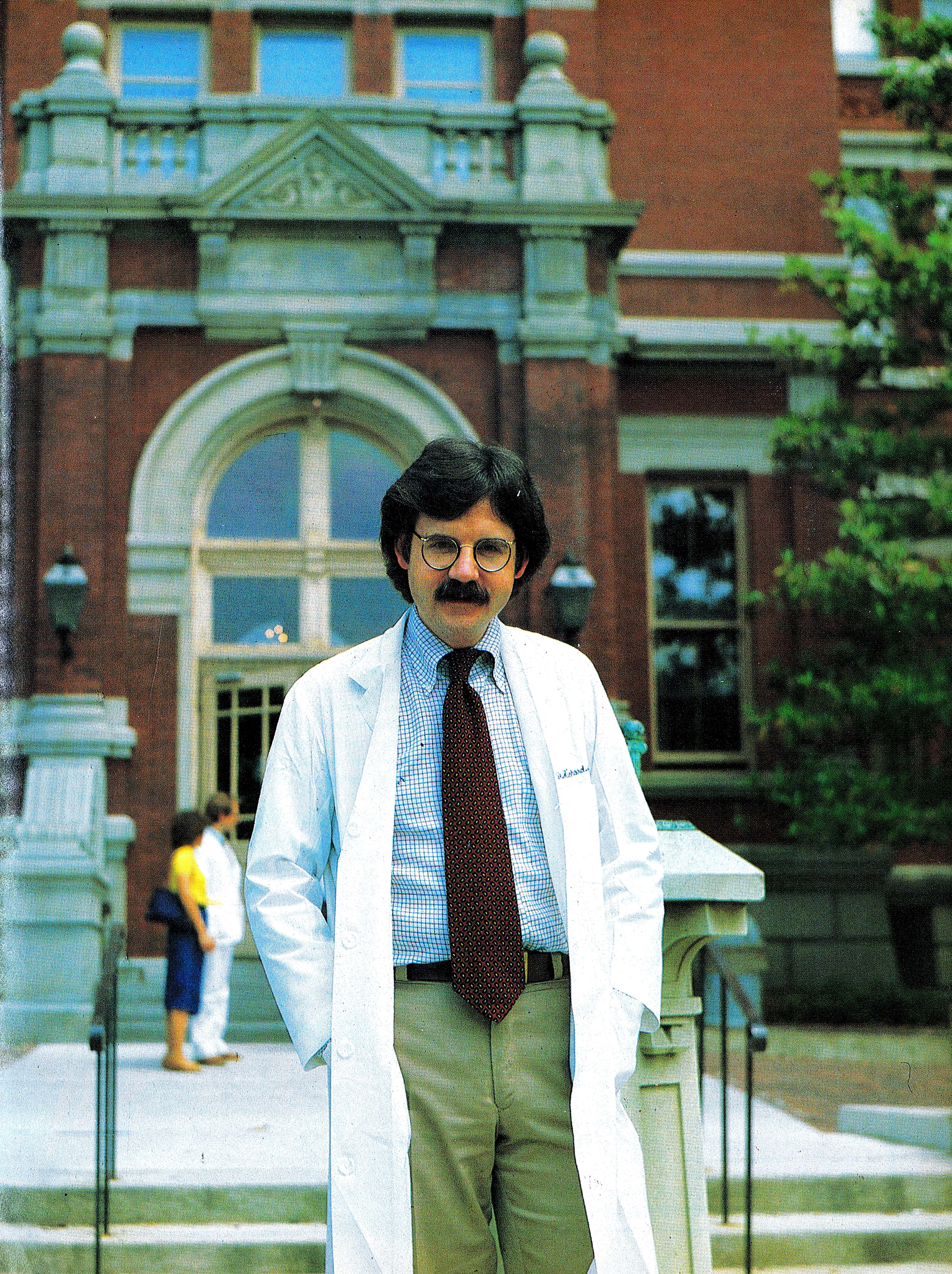


Above: Custom pH probe software is displayed by Dr. William Ravich. Right: Dr. Dick Johannes, graduate of '72, on the old hospital's front steps.

Ghosts walk the corridors of Johns Hopkins Hospital in Baltimore. Says one doctor who works on the ninth floor, "The walls talk to you late at night. Sometimes," he confides, "you can hear William Osler, one of the founders of the hospital, discussing the symptoms of an illness."

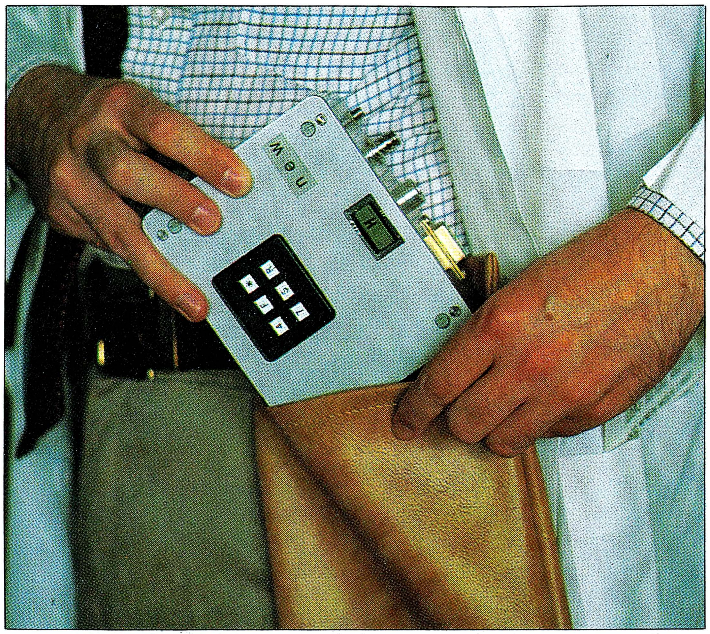
Osler, a Canadian physician, was a pioneer of institutional medical care. He initiated the doctors-in-residence concept and transformed medical practice from a European guild system to a business of live-in interning. He was also the first to create a formal record of the symptoms of more than one hundred illnesses, several of which now bear his name. Until that time—around the turn of the twentieth century—a diagnosis was about as good as a doctor's best guess.

Achievements by Johns Hopkins doctors constitute a succession of great moments in medicine: the first open-heart surgery, the first understanding of a drug's therapeutic action, and fundamental findings that led to a polio vaccine. The ghosts of those who achieved these milestones are here, along with the spirits of psychiatrist Adolf Myer, Harvey Cushing, the father of modern neurosurgery, and John Jacob Abel, the discoverer of adrenalin.



Some folks even claim to feel the presence of the restless soul of Edgar Allan Poe wandering nearby. Poe lived and died three blocks from here. Legend has it his bones were dug up by some medical students soon after he was buried; that's a prank that undoubtedly would have amused Poe.

Pale spirits of the past returning to Johns Hopkins would see changes in the hundred-year-old institute. It still occupies the same stately grounds as it enters its second century of research and healing. But it's being renovated now, inside and out. A new front door on Wolfe Street is only one of the alterations these ghosts would see in the huge red-brick hospital complex. They'd surely notice too that departments such as urology, surgery, trauma, and pediatrics, once scattered more or less randomly around the hospital, are now stacked in levels, one discipline per floor. And they'd behold other differences, both in medical education and in the way that medical research and practice are being carried out.



Above: Using the prototype, Johannes demonstrates how the pH probe is worn by a patient. Left: The colonoscope gives a clear picture of a patient's insides. Right: A hundred years ago, a Johns Hopkins surgeon wore the first pair of rubber gloves.

Johns Hopkins *is* haunted, but not by ghosts. It's haunted by tradition, a tradition of innovation, of doctors topping the accomplishments of their heroes and teachers. The institute is steeped in a rich history of medical milestones, radically new methods of health care, and character.

A Reputation for Innovation. Doctors at Johns Hopkins nowadays are pressured to at least equal their predecessors' best work or, preferably, to go them one or two better. "There's always all those famous people sitting over you, looking down and asking, 'Now what are you going to do?' " says Dr. Dick Johannes. The 1972 Johns Hopkins graduate has returned to the hospital as assistant professor of medicine. A specialist in two seemingly unrelated fields—gastroenterology and microcomputers—Johannes exemplifies in some ways the kind of change that has been going on here during the last few years.

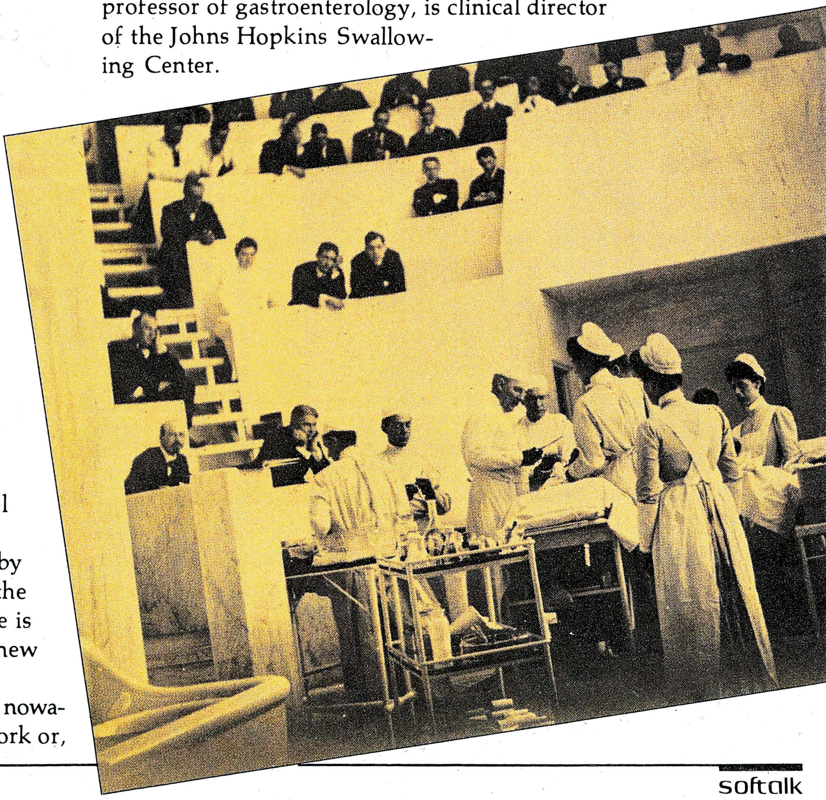
In speaking of his computing abilities, he admits to knowing less about micros than a data processing person, but more than your average doc. "I'm an interval person," he says, "walking on both sides of the fence."

According to recommendations resulting from a three-year study by the Association of Medical Colleges, the inclusion of computer science, along with the promotion of lifetime learning, is one of the new directions medical education must take in the information age. So far, relatively few medical schools have started using micros and minis to deal with the explosion of medical knowledge that threatens to overwhelm apprentice physicians today. Eventually, perhaps, all med schools will include computer literacy in their programs or specify it as prerequisite training.

Johannes's own computer work comes at a ripe moment in medical history. Before Johannes and others like him, there were few M.D.s who knew much about programming. Soon there will be many, some attempting to create their own specialized databases and database management systems, as Johannes is doing, and others creating software to work with diagnostic hardware invented by specialist colleagues.

Physicians like Johannes have taken to doctoring their own software. The fact that they've gotten involved with computers can be traced in part to their desire to stay as sharp as the next generation when the patter turns to pixels and palettes as well as to platelets and blood counts. A more pressing reason for their interest in programming is the lack of ready-made software suitable for the medical profession.

"It's an incredibly difficult problem if you have a sophisticated application. Most packages are light and commercial," says Dr. William Ravich, also of Johns Hopkins. "You try them and they're not quite right, or they're not at all useful. Ravich, also an assistant professor of gastroenterology, is clinical director of the Johns Hopkins Swallowing Center.



Johannes and Ravich, working together on two big Personal Computer projects, have come to the same conclusion: When it comes to software, it's best to roll your own. Johannes does the programming and Ravich gives the second opinion.

The more impressive of their collaborations, and also the more revolutionary, is an esophageal-reflux program that charts data taken from a pH probe (a device to measure acidity) that a patient swallows and keeps down for a day. To gastroenterologists, reflux in the esophagus, also called heartburn, is an ongoing mystery.

A major subject for speculation among gastrointestinal (GI) specialists is whether heartburn, like sunburn, is something one gets after exposure—in this case, to an acid event. Ravich's monitor, with Johannes's software, is helping to get the facts.

This medical detective work began ten years ago. "We would put down pH probes—wires with glass or metal tips. These were hooked to bulky monitoring machines on carts the patients had to push around," recalls Ravich. "Very fifties, space-age technology. After twenty-four hours, the severity of a patient's esophageal acidity was calculated from data recorded on a huge sheet of paper, using a tedious ruler, pencil, and calculator method."

Enter the Chip. Seventies technology brought doctors a choice of improvements over this Buck Rogers-and-the-seven-monks routine. They could go with either a cassette recorder system, like cardiologists, or a microprocessor unit. Guess which won.

A patient now wears a small metal box on his belt, with the probe wire taped to the side of his mouth. An 8K microprocessor with a 2K program measures acid attacks, converting analog information to digital.

The patient pushes a button when he feels a symptom like heartburn, chest pains, or sour mouth. On the screen, these pains are shown as points over the top of a ragged city-skyline-type chart. Then the visual evidence of acid activity is checked against the times when the patient reported symptoms. "The low points of the graph are the most interesting to the doctors—below the normal 5.00 pH level," explains Ravich. "The deeper the drop, the more acid."

Thanks to Johannes's software, it's now possible to dump sixteen to forty-four hours' worth of pH information from the handmade tin box into the pc in three minutes. While this is going on, the pH monitor recharges itself. Then the program charts the ups and downs of a patient's reflux activity, calculating when stomach acid entered the esophagus and how long it stayed there.

The characteristics of each reflux event, such as the time pH spends below normal level and the duration and depth of each episode, are of interest to people studying heartburn. "The more you look at it, the more complicated it gets," says Johannes.

Ravich is one of the developers of this pH monitor. The prototype was built from scratch, in concert with colleagues from the applied physics lab and the department of biomedical engineering at Johns Hopkins. Eventually, he explains, every hospital will have a pH monitor—providing that a development company gets involved in the production of the instrument. Johannes's software, which really enhances the monitor's usefulness, also enhances the probability that the monitor will find widespread use.

Johannes's other Personal Computer project is a database comprising ten years of colonoscopy information—and a set of tools with which to generate useful reports from the data.

A colonoscopy is a thorough search of the large intestine. The procedure used to be done with x-rays; now it's done by means of a snaking rubber fiberoptic video camera that crawls through a patient's bowels. A doctor observes the journey through a hand-held camera lens.

Thanks to Johannes's Basic, Pascal, and Fortran skills, which he picked up as a physician consultant to the hospital's IBM 370 installation several years ago, data from every colonoscopy performed at Johns Hopkins in the last decade is now on-line. That's over two thousand cases, handled by fifteen different doctors. It took Johannes a year to do the coding and a hired hand three months to keyboard the data.

Mixing Modules. Begun on an Apple while the programmer mastered various programming tongues, the database is part Basic and part Pascal; both parts are compiled and linked into a single exe file. "I stumbled onto the exe method," Johannes confesses. "There wasn't anybody to ask if it was a good idea to mix modules written in different languages." He has since found out that it works fine.

This isn't the sort of database program that will ever make the software bestseller list; it's just too specialized. But the colonoscopy database is of enormous benefit to a specialist like Johannes. "The GI tract is the major cause of morbidity these days," he explains. "In the early antibiotic era, you got sick and were cured. Now we're seeing illnesses that make you miserable, incapacitate you, and linger for years. These kinds of afflictions are taking over medical practice."

Risks of and the potential for intestinal illness can be calculated with the help of the database, and the current status of every person with a particular disease is immediately accessible. "It's nice to have a machine that remembers 2,265 people by name," Johannes quips.

Johannes now does his programming at home on a pc equipped with an 8087 math coprocessor, having traded up from the Apple when he was ready to bring the colonoscopy disks to the hospital.

Among other things, it was the eighty-column RGB video display, *EasyWriter*, memory addressability, and the function keys that cinched Johannes's decision to get the pc. The fact that Johns Hopkins uses IBM 370s did not enter into the decision, although, as it turns out, using the pcs as 370 terminals could save the hospital about two thousand dollars per workstation.

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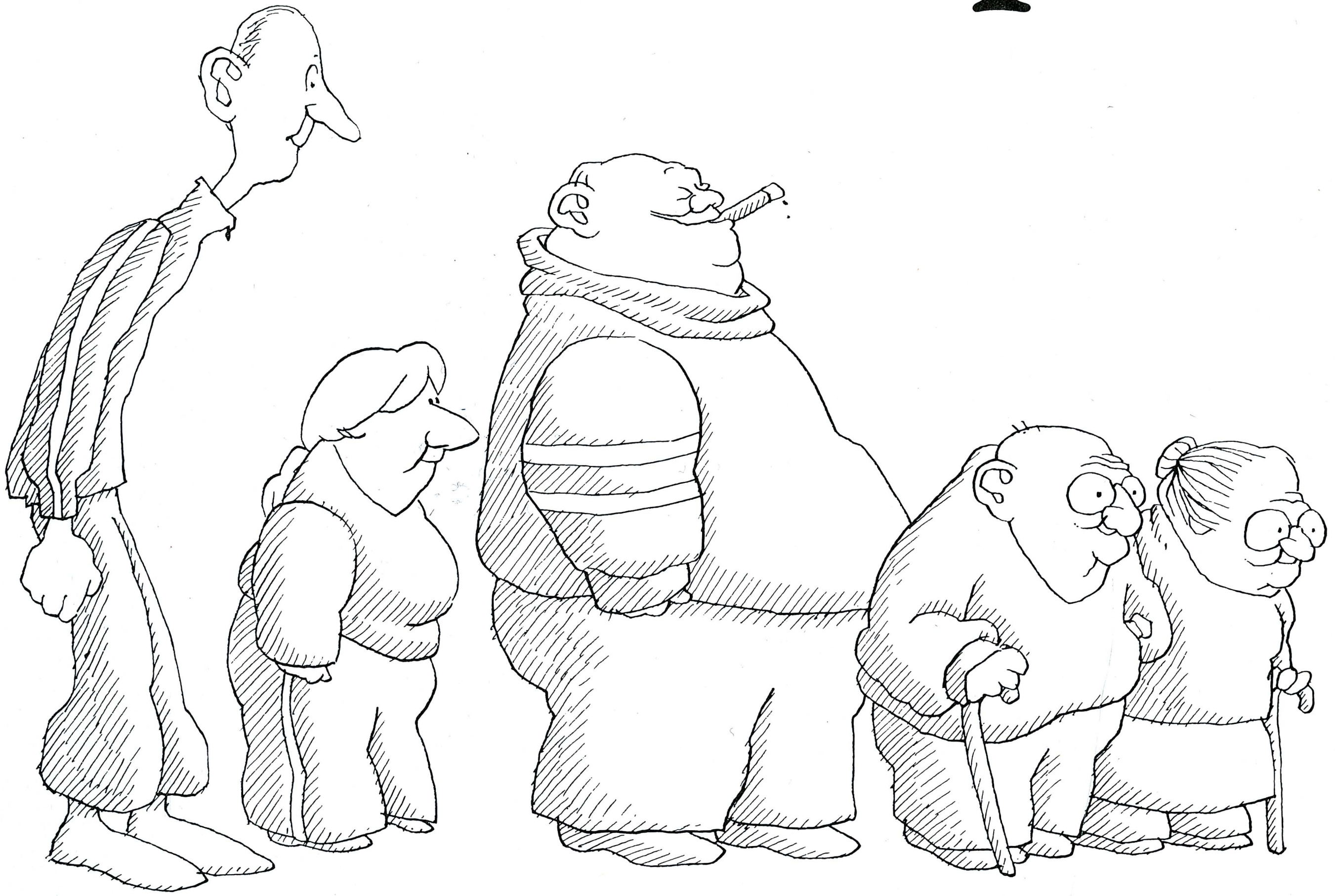

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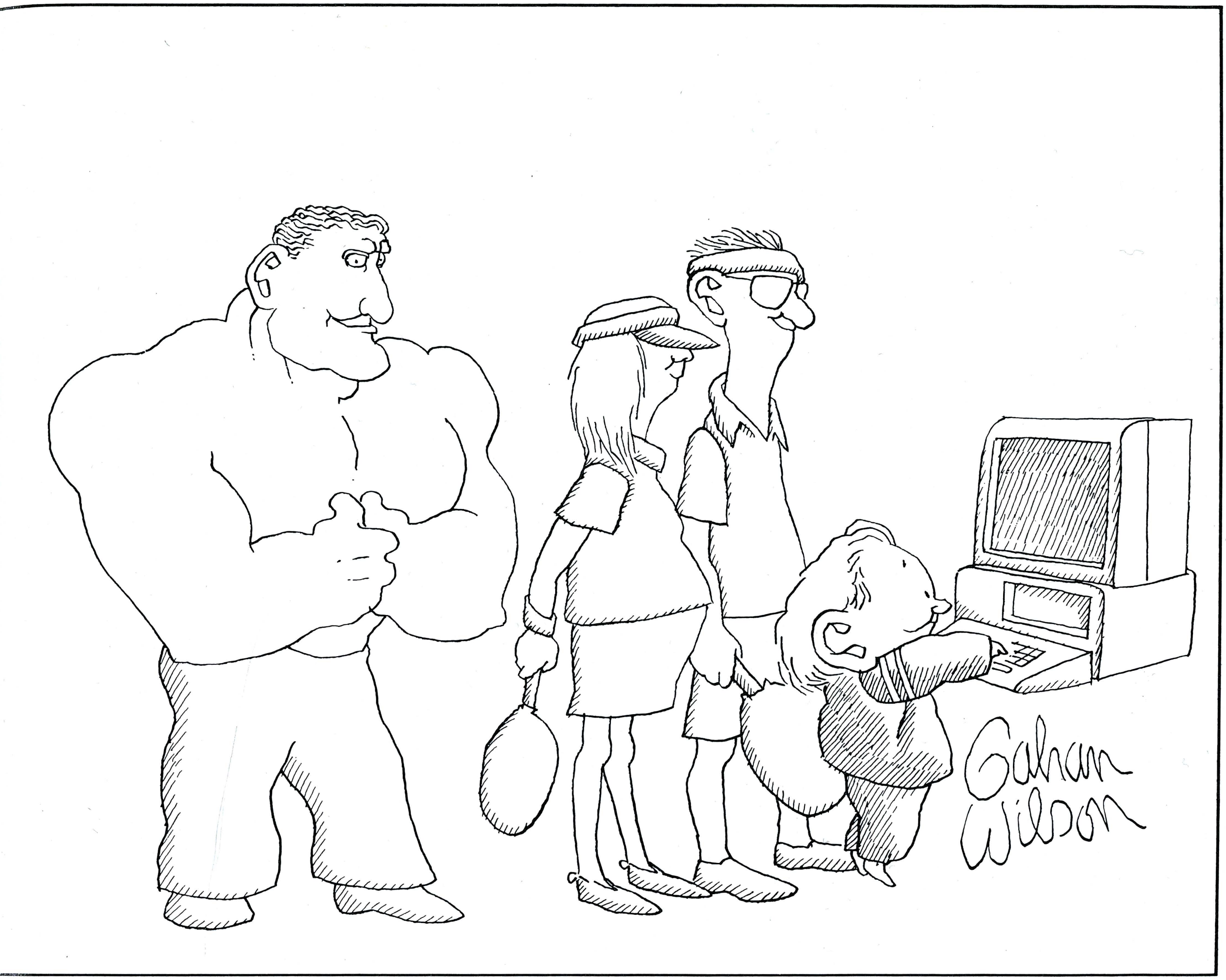

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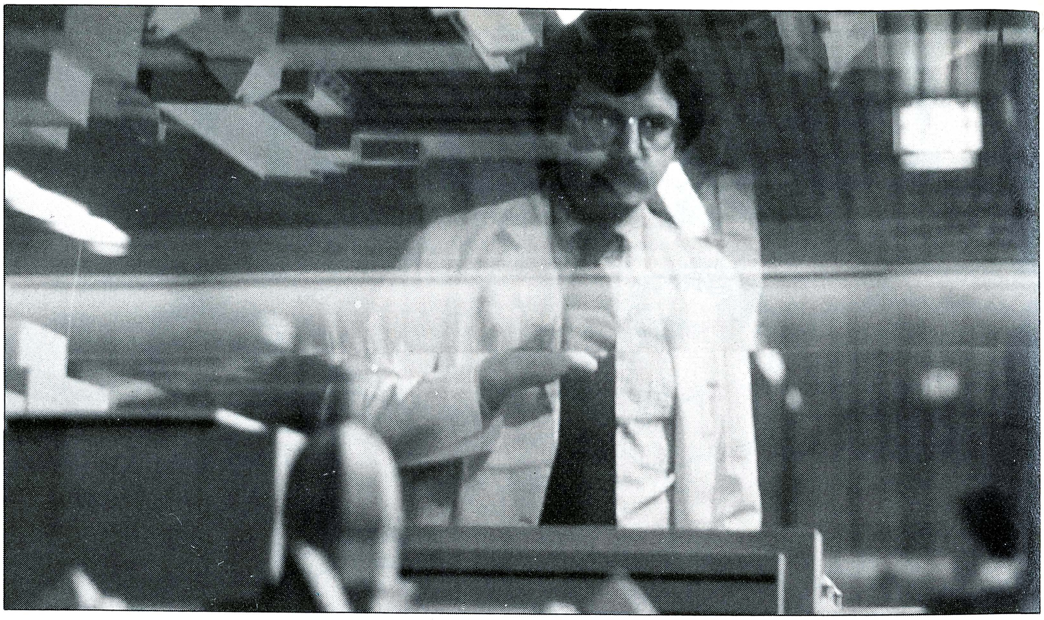

A model of the renovated hospital complex sits under glass in the spacious new reception area.

"I suppose I could have gone with an Apple IIe if it had been available a year ago," he says, but he's glad he didn't. Sixteen-bit speed is now a necessity. When you're accessing a single fact out of ten years' worth of patient records, you don't want it to take ten years.

Networking—The Tie that Binds. Networking is what makes micros really work in a large hospital. Currently a trio of pcs, networked to a Corvus hard disk with the Omninet system, is in use in the GI division. While interning, Johannes walked nine blocks for a lab report, thinking, "This is nuts." The main database is on the ninth floor of the Blalock Building, where he works, and new records are now entered by Linda Welch, the GI clinic coordinator, down on the third floor.

In the oncology center, seven other pcs are networked together. A lot of viral immunology lab data is figured on this network, with the help of *1-2-3,* and some locally written UCSD p-System programs, and a five-hundred-patient bone-marrow transplant database is shaping up. Johns Hopkins is one of the few bone-marrow-transplant centers in the United States. The database is being coded by Bill Burns, another doctor learning to program. The programming bug seems to be contagious.

A conference to standardize networking formats within institutions is the next item on Johannes's computing agenda. Achieving standardization among hospital departments and even among competing institutions is a priority with him.

Ravich concurs with Johannes on the importance of standardization: "This is a serious matter in medicine. Diseases have standards, and not all hospitals use the same standard terminology. This can hamper progress when doctors in separate hospitals are trying to define similar cases."

The art of diagnosis, says Johannes, is like "shooting at a moving target." Diseases often have shifting symptoms that change over time. Doctors must constantly monitor diagnostic data.

"In the case of a brand-new disease like AIDS, for example, it's crucial that every case discovered be reported and all symptoms collected for analysis in a hurry," he says. Only the rapid transfer of information between doctors and hospitals nationwide can take the fuzzy edges off diagnosing a potential epidemic.

Incidence of disease has its own ebbs and flows, which must also be tracked. "The peptic ulcer is going through a change right now," Johannes continues. "It has been around since antiquity. It was familiar to the Greeks. Now, apparently, its incidence is diminishing. Why that's so isn't clear." (Only their patients believe that doctors know it all.)

Gastro Graphics. Some light-pen graphics done in Pascal will be Johannes's next bit of programming on the colonoscopy database. A drawing of the colon will come up on-screen and, to enter the information, a doctor will need only point to the place where an intestinal abnormality has been found.

Actually, the entire program will be in Pascal by the end of the year. Basic is good, says Johannes—and bad. There's more power to the self-documenting Pascal. "Link-list routines are a nightmare in Basic," the doctor confides. "Seven months later you're looking and asking, 'What the hell is this statement doing?' "

On top of the Pascal revisions to the colonoscopy database, the pH monitor software, the future programming commitments, in-house consulting, and his ongoing medical work, Johannes has the strength to add Lisp to his repertoire.

He's a doctor who loves computers for more than just being terrific clinical tools. "They have the ability to answer a question that, before, couldn't even be asked," he says.

Let the illustrious ghosts of Johns Hopkins take note: This is what Dr. Johannes and his generation are doing. ▲

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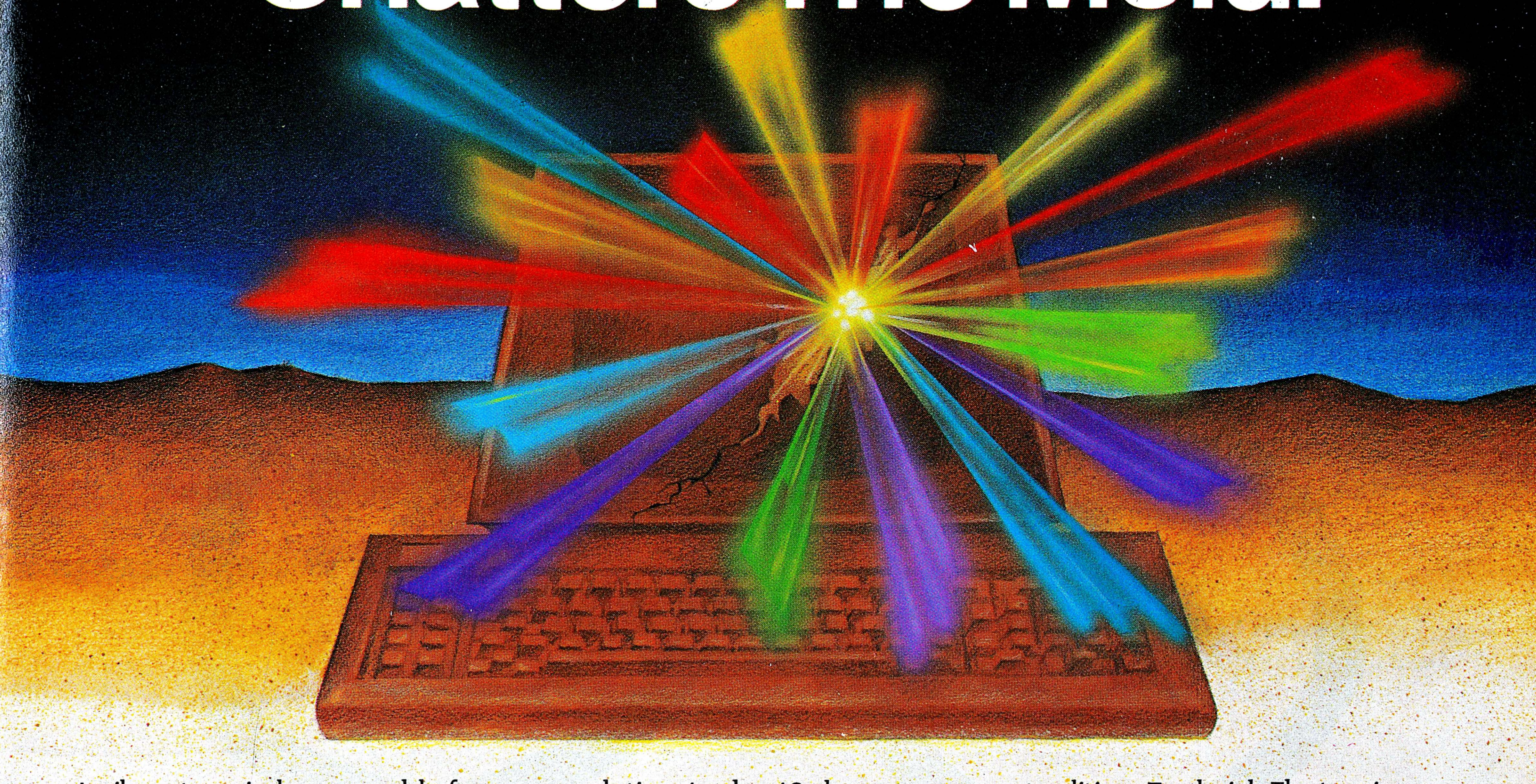

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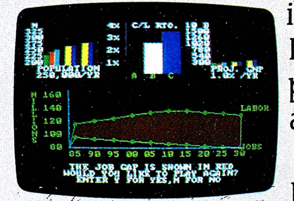

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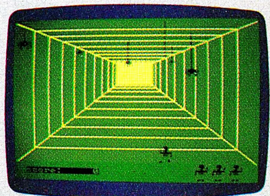

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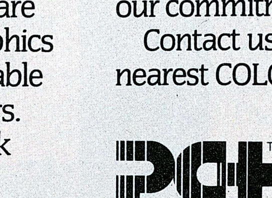

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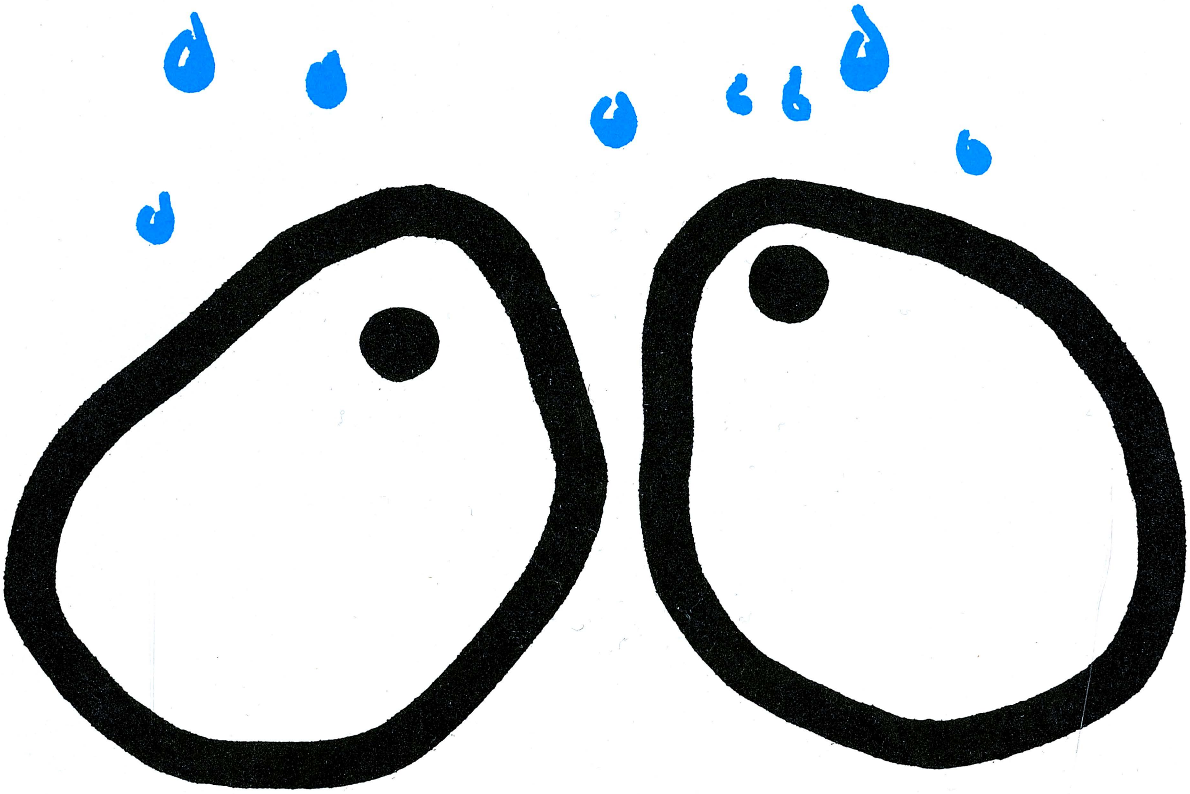

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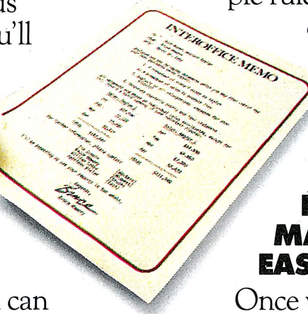

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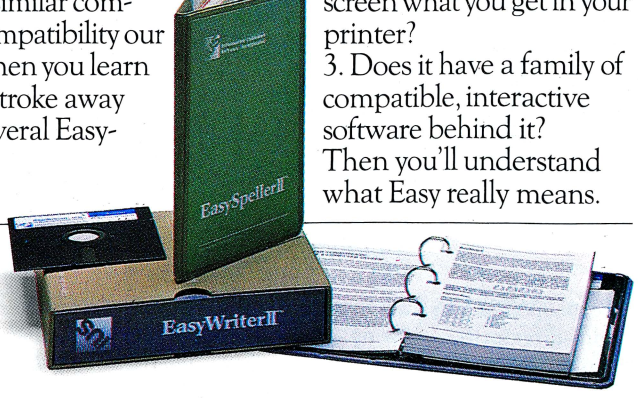

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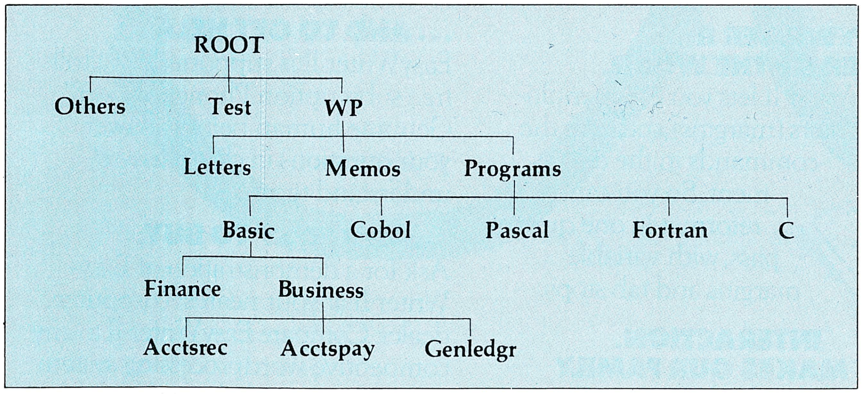
SYSTEM NOTEBOOK

by Alan Boyd

This month we'll wrap up our discussion of tree-structured directories and then take a look at some of the changes that version 2.0 has brought to our old familiar DOS commands. So far, we've constructed a not-very-complex tree-structured directory and played around with it in some fairly simple ways. In doing so, you may have realized just how easy it could be to get lost in a complex tree structure.

DOS offers a new command to help us find our way around complex directory forests. The *tree* command is an external command that creates a map of a hierarchical directory structure. To illustrate the tree command, we'll use it with a somewhat more complex version of the directory structure we created last month. A diagram of our overgrown tree looks like this:



Given this structure, the longest path we can traverse is from the root to one of the three directories under \WP\Programs\Basic\Business\dirname, five levels below the root directory. Applied to such a structure, the *tree* command can produce a report that supplies all of the information necessary to reconstruct this diagram. For example, with a DOS disk in drive A and a disk with the above structure on it in drive B, the tree command would produce the following report:

```
A:TREE B:
DIRECTORY PATH LISTING FOR VOLUME ???????????
Path: \WP
Sub-directories:    LETTERS
                    MEMOS
                    PROGRAMS
Path: \WP\LETTERS
Sub-directories:    None
Path: \WP\MEMOS
Sub-directories:    None
Path: \WP\PROGRAMS
Sub-directories:    BASIC
                    COBOL
                    PASCAL
                    FORTRAN
                    C
Path: \WP\PROGRAMS\BASIC
Sub-directories:    BUSINESS
                    FINANCE
Path: \WP\PROGRAMS\BASIC\BUSINESS
Sub-directories:    ACCTSREC
                    ACCTSPAY
```

The report is fairly long, because of the complexity of the structure to which it is being applied.

There is one switch that can be applied to the *tree* command—the /F, or *files* switch. When this option is exercised, *tree* will list, in addition to the standard directory path information, all the files in each directory. Taking our sample directory structure, when the command *tree/f* processed the \ WP\Programs directory, it would output

```
Path: \WP\PROGRAMS
Sub-directories:          BASIC
                          COBOL
                          PASCAL
                          FORTRAN
                          C

Files:                    CODE1     .SRC
                          CODE2     .SRC
                          CODE3     .SRC
                          CODE4     .SRC
                          MENU      .SRC
```

For anyone constructing a complex hierarchical directory on a high-capacity hard disk, it's a good idea to run the *tree* command at regular intervals, preferably with the printer turned on (control-P) so that a hard copy can be created. If you ever forget which directory a file is stored in, or the pathname required to access a file, this listing could prove quite valuable.

Now that we know how to construct a complex directory structure, let's destroy one. DOS 2.0 has a command that lets us do that fairly easily: *rmdir*, meaning remove a directory. *Rmdir* is an internal DOS command; like its cousins *chdir* and *mkdir*, it also has a short form, *rd*.

There is one very important point to keep in mind when trying to delete directories: *rmdir* will not allow you to remove a directory that contains any entries, whether they are subdirectories or files. That means that before a directory can be removed, it must be at the end of the path and must not contain any files. Given the alarming ease with which data can be erased, this approach is reassuring. DOS will abort any attempt to erase a directory with files or subdirectories in it and will issue the message

```
Invalid path, not directory,
or directory not empty
```

Like the *mkdir* command, *rmdir* will accept either relative or absolute pathnames.

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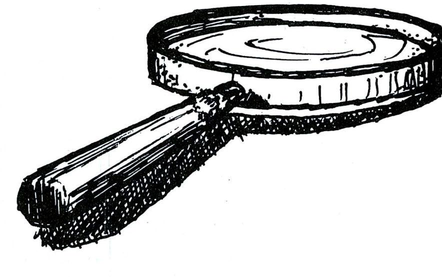

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The Pizza Program

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Are you tired of the same old thing for dinner? Would you like more variety in your evening meal? Is there something you'd rather have but don't get very often? The Pizza Program is designed just for you. It's a delightful new software package designed to end the dinner-blahs with computer generated menus. Here is how it works.

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Want to go out to your favorite restaurant? Enter the restaurant's name as a "Main Course." Now your computer will automatically remind you to go out to eat—and as often as you select. It will delete all other items from that meal except the name of the restaurant.

AUTOMATIC SHOPPING LIST

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Also, it generates a per serving calorie counter. This is easy to delete anytime you are not in a diet mood or want to celebrate for any reason. You never count calories unless you want to.

RANDOMLY DELICIOUS

Say goodby to boring meals. Your computer will remember variety is the spice of life. This system makes eating at home a pleasure again. Each menu is randomly generated from major food groups according to the specific criteria you select. The system is easy to learn and easy to operate. Yet it is a sophisticated piece of software which will prevent menu mix-ups.

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OUT OF THE RUT

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Take care in the design of your directory structures and you won't have to use this command very often. There is one time when the use of *rmdir* is almost unavoidable, however: Because the *rename* command cannot be applied to directories, you will have to copy your old directory structure into a structure with your new name, and then use *rmdir* on the old structure. That's a rather drastic measure, but it gets the job done while protecting the integrity of your directory structures.

In addition to complexity, a drawback to adding subdirectories is the overhead each new one exacts. A quick experiment on a blank disk will show that when you create a new directory DOS extracts 512 bytes from the space available on disk. While that doesn't amount to much on a hard disk, a complex directory structure on a floppy can easily eat up a significant amount of space.

Keeping in mind both the advantages and disadvantages of tree-structured directories, some general rules for their wise use can be divined. First, use them only when you're working with a large hard disk; they really don't offer that many advantages on low-capacity floppies. Second, to guarantee that you won't get lost in the limbs—or, worse, "lose" whole directories and their associated files—restrict the tree structure to as few hierarchical levels as possible. Third, keep the names of directories short; you're going to be typing them a lot.

New, Improved Format. Now that we've climbed around tree-structured directories, let's take a look at the changes to our old familiar DOS commands; several of these old standbys have been radically enhanced. The first command we'll look at is *format*.

While the function of *format* in DOS 2.0 remains the same—to configure blank disks for use with DOS—several new options have been added. As you probably know, the general form of the command is

FORMAT D:[switches]

where *D:* represents the drive containing the disk to be formatted (the target disk), and *[switches]* specifies which, if any, of the available options are selected. The changes to *format* under version 2.0 are to be found in the plethora of new switches that have been added.

As with DOS 1.1, the switch */1* requests the creation of a single-sided disk, even though the drive may be double-sided. Without this switch, DOS takes its cue from the type of drive: If the drive has double-sided capabilities, the disk will be formatted double-sided. DOS 2.0 adds a switch—the */8* switch—that looks similar but performs a very different function. This switch tells DOS to format the target disk with eight sectors per track—that is, format the disk to be compatible with earlier versions of DOS. As you may remember, version 2.0 has the very pleasant capability of storing 12 percent more data on a disk than could earlier incarnations. It does this by creating nine sectors on a track, one more than earlier versions of DOS allowed.

When DOS reads or writes a disk, it automatically determines whether that disk has eight or nine sectors per track. This impacts the user as little as possible, and overcomes many of the headaches that frequently arise from having a variety of disk formats in a single-user environment. Most of the time, you don't need to worry about whether a disk was formatted with eight or nine sectors per track. However, for those times when it may be necessary to write a disk with only eight sectors per track—creating a disk that will be sent to someone who may not yet be running version 2.0, for example—formatting the disk with the */8* option will guarantee compatibility.

Another new option in the *format* command is the */B* switch. This will primarily be used by software vendors to guarantee that the user will be able to write on the disk whatever version of DOS he or she is running. The */B* switch has two effects: The target disk is formatted with eight sectors per track, and several sectors are marked as used in the File Allocation Table. The sectors marked

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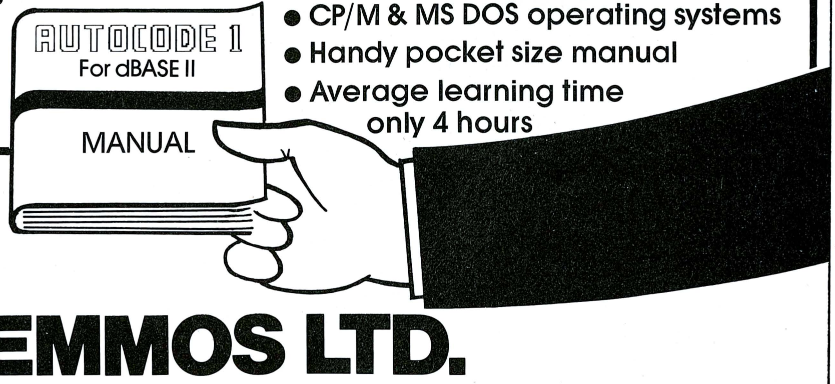

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used are the ones that will normally contain the DOS system files Ibmbio.com and Ibmdos.com.

As in previous DOS versions, the */S* switch can be used to create a disk with DOS on it; the operation of the *format* command when used in conjunction with the */S* switch has not changed.

A welcome addition to the *format* family is the */V* switch, which allows a volume name to be written on the disk. A volume name is a label specified by the user; DOS writes the name into a special location on the disk. The volume name is then displayed during directory and *chkdsk* commands; alternatively, the new command *vol* can be used to display the volume name.

The procedure to assign a volume label is straightforward:

```
A>FORMAT B:/V
```

When DOS has finished formatting the disk, it will prompt

```
Volume label (11 characters, ENTER for none)?
```

In addition to the standard set of characters that are legal for filenames, the space character may be included in a volume name. As with filenames, all characters will be converted to upper case when they're written to disk. The assigned volume name will appear at the top of all directory hierarchy. In addition to providing a backup to the paper label, storing the volume name on the disk itself allows applications programs to verify that they are indeed working with the right disk. Formatting hard disks is done exactly the same way as formatting a floppy.

As with all of the other DOS commands that use switches, *format* can be used with multiple switches. For example, to create a disk with DOS on it and assign it a volume name, execute the command

```
A>FORMAT B:/S/V
```

Notice that there are some combinations of switches that are contradictory and therefore illegal. For example, you can't use the */B* switch (which says, "Reserve room for DOS, but don't write it") in conjunction with the */S* switch (which says, "Write it"). And while not mutually contradictory, the */V* and */B* switches cannot be combined.

An Intelligent Diskcopy. The new disk format creates a potential problem for *diskcopy*. The problem arises if you attempt to copy a disk formatted with nine sectors per track to a target disk formatted with eight sectors per track. Since the source disk could contain more data than the target disk can hold, issuing such a command could be asking for the impossible. Likewise, it's impossible to *diskcopy* a double-sided source onto a single-sided target. *Diskcopy* neatly sidesteps this problem by reformatting the target disk to the specifications of the source disk when it detects a difference; this cures any incompatibility problems that could arise.

As a consequence, you don't have to format a target disk before doing a *diskcopy*. To show that the target disk is either not formatted or is formatted differently from the source disk, *diskcopy*, under both versions 1.1 and 2.0, displays the message

```
Formatting while copying
```

as well as a message detailing how many sides and sectors per track it has found on the source disk.

A More Conscientious Chkdsk. A major beneficiary of the changeover to version 2.0 is *chkdsk*. This harder-working command, which now has two optional switches, takes the form

```
A>CHKDSK d:filename F/V
```

When a filename is specified, *chkdsk* now reports on the distribution of the files on the disk (after it generates its usual report). The report might look something like this:

```
A>chkdsk b:*.*
      179712 bytes total disk space
      10752 bytes in two user files
      168960 bytes available on disk
      131072 bytes total memory
      106496 bytes free
All specified files(s) are contiguous.
```

The report that all the files are contiguous means that, for each file, all sectors are adjacent—that is, the file has not become fragmented and spread around the disk. Fragmentation can occur, for example, if a short file located somewhere in the middle of the disk is deleted and then a long file is written to the disk. Because DOS allocates the earliest available disk space, the first portion of the new long file is written in the middle of the disk, where the old short file had been. The remainder of the new long file is written at the end of the disk. While this example illustrates a file fragmented into only two chunks, you can well imagine how a lot of interspersed erasing and writing could lead to very fragmented files.

Noncontiguous files are not bad or dangerous; they merely slow down reading and writing procedures, since they cannot be read from or written to as one large block. You probably know when a file is badly fragmented; the disk drive sounds more like a buzz saw than usual. That noise is caused by the movement of the head back and forth to different tracks. You can confirm your suspicions by requesting a *chkdsk* on the file; your answer might look something like this:

```
B:\ARTICLE.BAK
   Contains 5 noncontiguous blocks.
```

If the *chkdsk* command reports many noncontiguous files, you can clean it up by copying all the files on the disk to a new disk (*copy *.**; don't forget to copy each directory). The *copy* command cleans up fragmented files by writing them to contiguous blocks on the target disk.

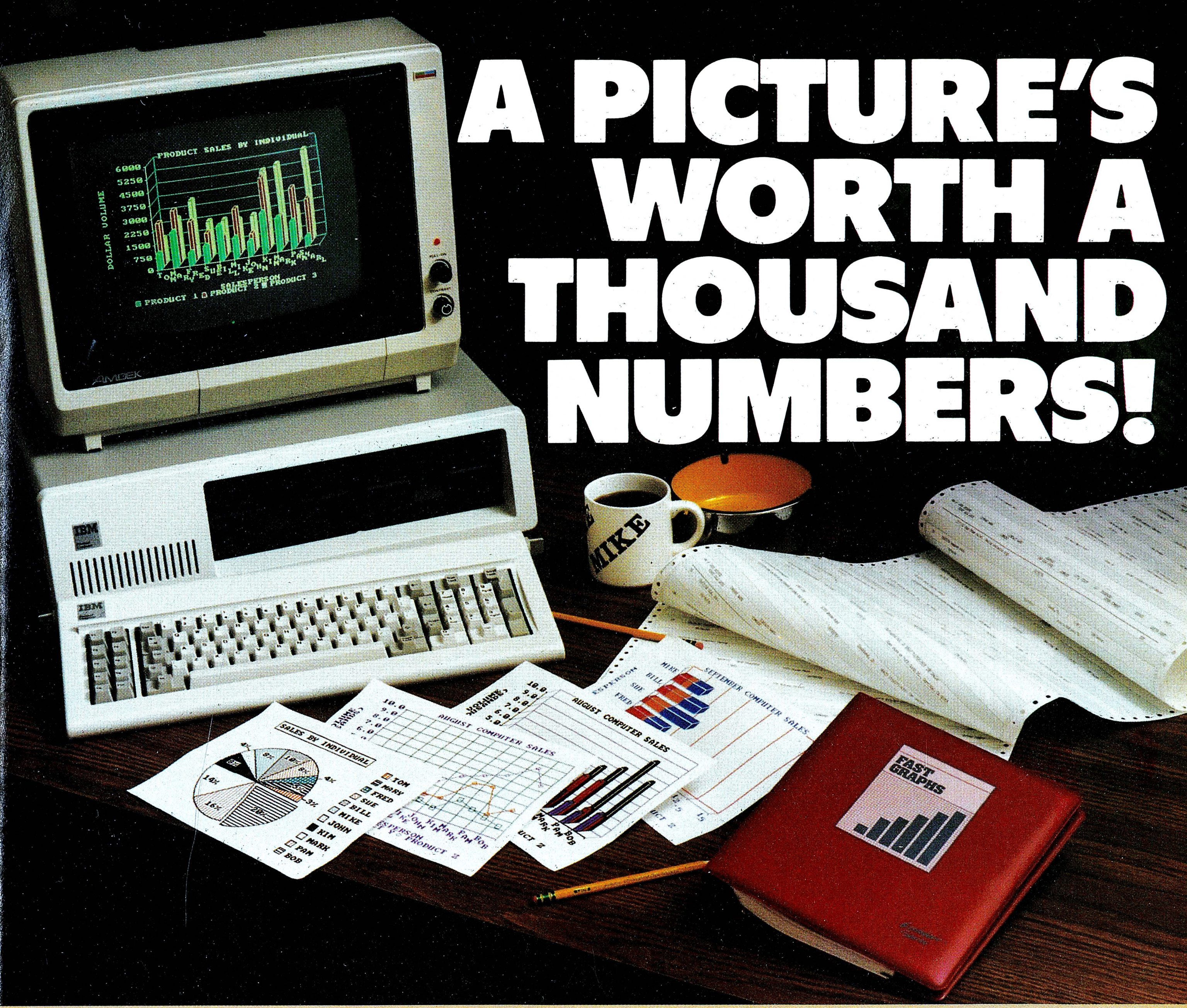
Incidentally, it's important to note that when you're using hierarchical directories, any command that contains a wildcard character (* or ?) operates only on the currently logged directory (unless, of course, you've included a specific pathname). Files stored in a directory other than the current one will be ignored.

Another major change to *chkdsk* becomes apparent when the command unearths errors in the File Allocation Table: *Chkdsk* reports the error but no longer automatically corrects it, as it did under previous DOS versions. Instead, the */F* switch (for *fix*) must be set to tell *chkdsk* to correct any errors it finds. The switch was added presumably because some users had found that strange or unusual file structures could be damaged by indiscriminate use of the old *chkdsk*.

The other new *chkdsk* switch, */V*, invokes a version of the command that reports additional information, including more detailed error data and a directory. The standard procedure for using the new *chkdsk* is as follows: First run the command with no switches. If errors in the file are found, rerun the command with the */V* switch for more complete error reporting. Finally, if you determine that the errors could be destructive (for example, if you have two files sharing a common block in the File Allocation Table), rerun *chkdsk* with the */F* switch to clean up the errors.

If *chkdsk*, running with the */F* switch, finds any lost clusters (that is, clusters that are marked as used in the File Allocation Table but that aren't associated with any files), you may instruct the command to bundle them, thereby creating a group of standard files from the lost clusters. These files will be placed in the root directory and will be given the special names Filexxxx.chk, where xxxx represents a sequential number between 0000 and 9999. By putting the clusters into special files, you may check their contents via standard commands, such as *type*, to see if they contain any valuable information. If the contents are junk, you can free the clusters simply by deleting the files.

Two very powerful new features of DOS 2.0 are I/O redirection and piping. Piping, which is essentially an extension of I/O redirection, allows you to transfer the output of a command either to a file or to another command. The latter option is especially useful for commands like *chkdsk* or *dir*. Piping is both an elegant and powerful tool—as we shall see next month. ▲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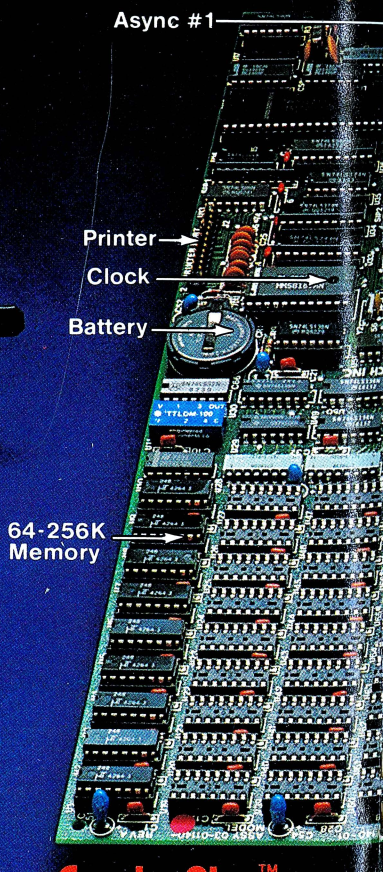

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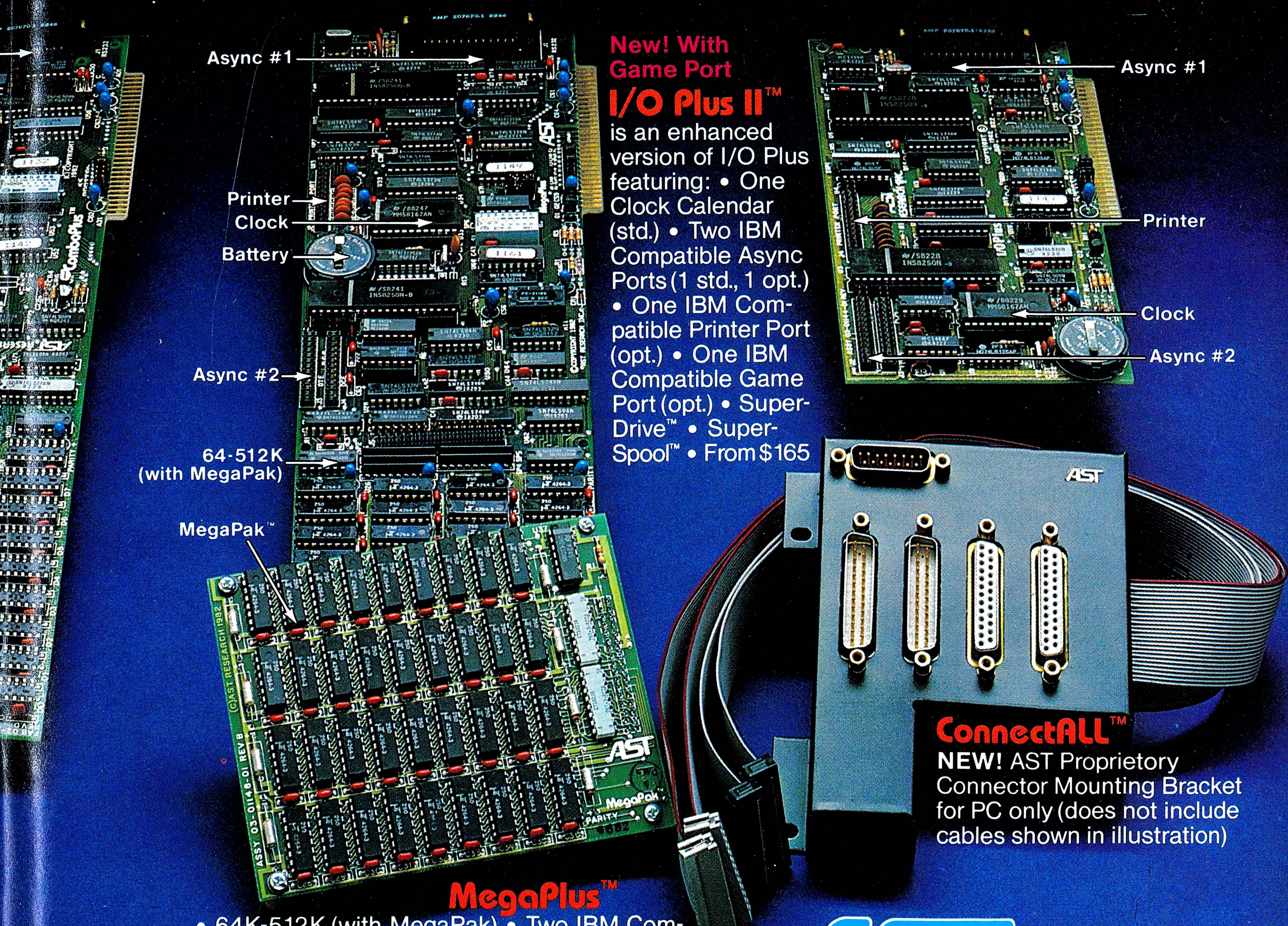

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THE PROFIT PLOT

by Jack Grushcow

This month we'll delve into some of the more complex aspects of spreadsheet use. We'll unravel the (apparent) mysteries of the *Lookup* and *Choose* functions. Then, next month, we'll get into the logical functions—*If*, *And*, *Not*, and *Or*. Once we've covered that ground, we'll use these advanced functions to construct a detailed employee payroll spreadsheet.

We'll start with Lookup. The purpose of this function is to automate the selection of an appropriate value from a list of values.

The general form of the Lookup function is:

LOOKUP(INDEX,RANGE)

VisiCalc users, of course, must add an "at" sign (@) before the function name (as in *@Lookup*).

Index and *range* are said to be the arguments of the function; the term argument here means a value (it may be a simple number, a formula, or even a range of cells) upon which a command or function is to be carried out.

The Lookup function behaves a bit like a person searching for a book in a library. In a library, you first go to the card catalog and find the number of the book you want; then you use that number as an index, or selector, to help you pick the appropriate book off the shelf. Lookup goes through these same two steps. First it evaluates the index specified in the Lookup formula (the first argument of the formula), then it uses that value to scan through the range of cells specified as the formula's second argument.

But then Lookup does something else. When it matches a value in the range to the value specified as the index, it returns *not* the matched value (as you might expect), but the value next door. If the range is a row, the Lookup function returns the value directly below whichever cell in the range matches the index; if the range is a column, Lookup returns the value in the cell directly to the right of the match.

Let's make this a little more concrete. Suppose you sell a product that has a discount structure based on size of order. If the discount is directly proportional to the sales price, you don't need Lookup; you can just calculate the discount as a percentage of the sales price. In the more common situation, however, where the discount isn't directly proportional to the sales price, Lookup can automatically select the correct discount for any sales price.

Let's assume the discount table looks like this:

Value of order	Discount
$100-499	**2%**
$500-999	**3%**
$1,000-4,999	**4%**
over $5,000	**5%**

To calculate the cost of an order we need some way to select the applicable discount. Examine the spreadsheet in figure 1.

We'll use cell B1 for the list price of the order; B2 will hold the correct discount, based on the cost of the order; and B3 will calculate the appropriately discounted price of the order. Let's see how to use Lookup so that the correct discount is displayed at B2.

	A	B	C	D	E	F	G
1	Cost						
2	Discount						
3	Customer net						
4							
5							
6	Cost		0	100	500	1000	5000
7	Discount		0	2	3	4	5

Figure 1.

Rows 6 and 7 hold the lookup table. Row 6 holds the range that Lookup will scan through for a match, and line 7 holds the information that Lookup will return when it finds a match. Note that the values in row 6 are arranged in ascending order. This is important.

What we want Lookup to do is compare the value held at B1 against the values in row 6; when it finds a match in row 6, we want it to return the value in row 7 that lies directly below the matching cell.

In order for this procedure to be of any use to us, we need to have the Lookup function take a rather broad interpretation of the concept *match*. And, fortunately, that's just what it does.

Lookup scans through row 6, looking for a value there that exactly matches the value at B1. If it finds such an exact match, it stops, goes straight down to row 7, and returns the value it finds directly below the matching cell. If it finds no exact match in row 6, it continues scanning until it encounters a value greater than that held at B1. Then it backs up one cell in row 6, drops down to row 7, and returns the value it finds there in row 7.

Okay, now let's plug the Lookup formula into our spreadsheet. That done, you can experiment by putting various values into B1 and seeing what kind of results you get in B2 and B3. Figure 2 shows the spreadsheet complete with Lookup formula.

	A	B	C	D	E	F	G
1	Cost						
2	Discount	@LOOKUP(B1,C6...G6)/100					
3	Customer net	+B1*(1−B2)					
4							
5							
6	List price		0	100	500	1000	5000
7	Discount		0	2	3	4	5

Figure 2.

Lookup uses B1 as an index into the range C6 to G6 and then grabs a discount figure from row 7. Then it converts the discount figure to a percentage by dividing by 100. Finally, to get the selling price of the order, the formula at B3 takes the result of B2's labor and applies it to the list price entered at B1.

Figure 3 is a list of what the Lookup formula stored at B2 will return based on various (arbitrary) entries at B1.

B1: List price	50	250	99	1500	6000	500
B2: Discount	0	.02	0	.04	.05	.03
B3: Customer net	50	245	99	1440	5700	485

Figure 3.

In the example of the fifty-unit order, Lookup examines the first value in row 6. It sees a 0. Since zero doesn't match or exceed 50, Lookup goes on to the next value in the range. Here it finds the number 100. Since 100 is greater than 50, Lookup backs up one number in the index range—to the 0. Then it selects 0—the discount percentage below the 0 in the index range. A discount of zero, of course, means no difference between list price and customer net.

In the next example, Lookup scans the index for a number equal to or greater than 250. It skips the 0 and 100 and stops at 500. Then it selects the number 2 from the discount list.

Imagine the list-price list in row 6 as a series of barriers, each trying to trap the index. A specific order cost can challenge the next barrier only by being greater than the previous one. When the index finally encounters a barrier it can't cross, it selects the answer beneath the last barrier successfully challenged.

This game of electronic hurdles has several rules. First, if the index is less than the first item in the hurdle range, Lookup returns NA. Being blocked by the first barrier means having no value to reach back for. Our would-be hurdler has had a pretrial washout.

Second, an actual match results in the selection of the value directly beneath the matching hurdle.

Third, if the index is larger than any value in the hurdle list, the value below the last value in the list is returned.

Now we can get back to how our lookup table has been constructed, which is critical to the successful use of the function. You must learn to translate from a list you use in real life to a list Lookup can use.

To examine how we went from the "human-readable" discount list to the one Lookup could use, let's go back to our initial discount table. Our first category is for orders of between $100 and $499.

Since we'll have orders of less than $100, our first barrier must catch them. If we forget this category and start our list with the value 100, we'll have problems. An order of $35, for example, would be less than the first value in the list, and would cause Lookup to return an NA; the NA would get propagated into any cell whose formula referred to B2, so our bottom line—our selling price—would also turn out to be NA.

So, we have to supply a range that will allow Lookup to return a zero discount for orders ranging up to $99, since these will not qualify for a discount.

We set the first part of our lookup table thus:

Cost	0	100
Discount	0	2

Remember, each time an index is compared to a value in the

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lookup list it will bounce back from one that exceeds it. In our example, orders of less than $100 will bounce off the 100 barrier and cause a discount of 0 percent to be selected.

We erect our next barrier at the 500 mark, which will create a 2 percent discount for orders between $100 and $499. Now our lookup table appears as follows:

Cost	0	100	500
Discount	0	2	3

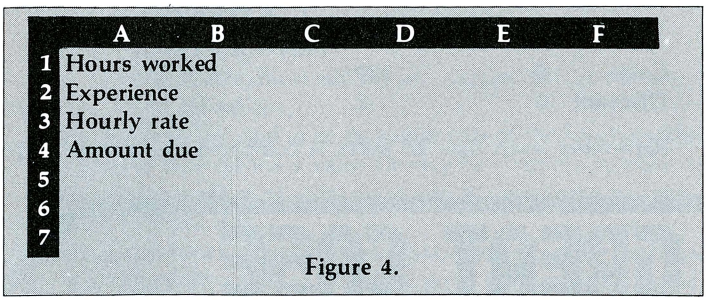
Now that we've established the pattern, you should be able to create the lookup table in the discount model.

For more practice, let's use Lookup in another example.

Many professional services bill clients on an hourly basis. Architectural and engineering firms, for example, use varying bill-out rates, which often depend on an employee's experience level. Suppose a company has a list of hourly billing rates such as these:

Years of experience	Hourly billing rate
1-2	18.50
3-5	24.00
6-8	35.00
9 or more	41.00

Try to complete the outlined spreadsheet in figure 4 on your own, adding the required formulas and lists.

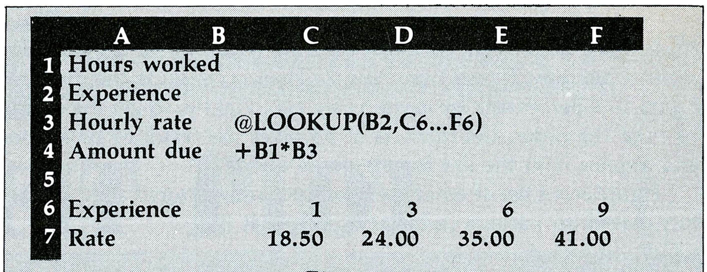


	A	B	C	D	E	F
1	Hours worked					
2	Experience					
3	Hourly rate					
4	Amount due					
5						
6						
7						

Figure 4.

Assume that the hours worked will be entered at B1 and the experience at B2. You'll need to have Lookup scan a table to select the appropriate hourly wage.

One possible solution is shown in figure 5.

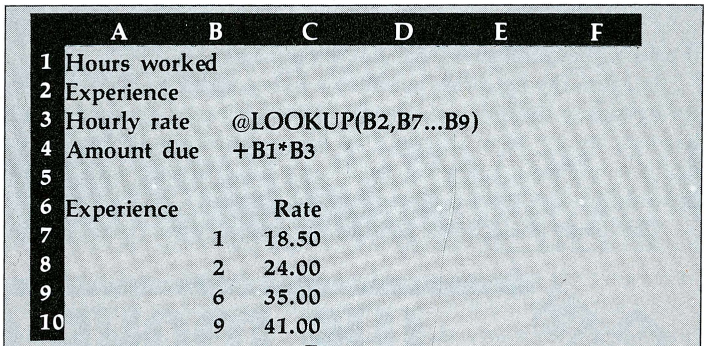


	A	B	C	D	E	F
1	Hours worked					
2	Experience					
3	Hourly rate	@LOOKUP(B2,C6...F6)				
4	Amount due	+B1*B3				
5						
6	Experience		1	3	6	9
7	Rate		18.50	24.00	35.00	41.00

Figure 5.

The solution in figure 5 is one way to approach the billing application. An equally valid solution appears in figure 6; the only difference between the solutions shown in figures 5 and 6 is that the lookup table in figure 6 is in two columns instead of two rows. Lookup can scan columns as well as rows. The syntax for the function is the same; the function automatically adjusts by selecting values from the column to the right of the specified range.

Use either row- or column-oriented lookup tables in your spreadsheets, depending on which suits the structure of your model. It's up to you. Just be sure the ranges and data tables are correct.



	A	B	C	D	E	F
1	Hours worked					
2	Experience					
3	Hourly rate	@LOOKUP(B2,B7...B9)				
4	Amount due	+B1*B3				
5						
6	Experience		Rate			
7		1	18.50			
8		2	24.00			
9		6	35.00			
10		9	41.00			

Figure 6.

Lotus's *1-2-3* uses a variation on the lookup theme. *1-2-3* has two lookup commands: @HLookup, which scans horizontal (row-oriented) lookup tables, and @VLookup, which scans vertical tables.

The general form of the commands is:

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@HLOOKUP (INDEX,TABLE,OFFSET)
@VLOOKUP (INDEX,TABLE,OFFSET)

The index in these commands is identical in function to the index in *VisiCalc/SuperCalc* lookup functions; it acts as a criterion for the lookup function to match. The second and third arguments in *1-2-3*'s lookup commands take them a dimension beyond what was offered in earlier spreadsheet programs.

Table can be a grid composed of any number of rows and columns. The first row in the HLookup table or the first column in the VLookup table acts as the range that's scanned for a match. *Offset* allows you to select the row (HLookup) or column (VLookup) you'll pick the value from.

As an example of the use of HLookup, there's a little spreadsheet in figure 7 that keeps track of personnel information.

	A	B	C	D	E	F
1	Employee name					
2	Employee #					
3	Salary		@HLOOKUP(B2.C8...F11,1)			
4	Experience		@HLOOKUP(B2,C8...F11,2)			
5	Department #		@HLOOKUP(B2,C8...F11,3)			
6						
7	EMPLOYEE INFORMATION TABLE					
8	Employee #		100	110	120	130
9	Salary		24,000	22,000	28,000	27,000
10	Experience		3	3	5	4
11	Department #		202	100	98	105

Figure 7.

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The HLookup table extends from C8 to F11. The top row of this table, C8 to F8, contains the values that HLookup will scan to find a match to the index value (held in B2).

The *offset*, the third argument in the HLookup function, specifies which row of the table you want to get your data from. If the offset is 1, HLookup behaves just like a *VisiCalc* lookup; it returns the value directly below the index match. If the offset is 2, HLookup drops to the second row below the index match, and so on. This extension of the Lookup function allows you to select several different pieces of data based on a single index match.

For example, to look up an employee's salary, we use an offset of 1; experience is found using an offset of 2; and department with an offset of 3. Type in the employee number at B2 and the HLookup formulas will display the salary, experience, and department for the specific employee number matched in the index range.

A cousin of the Lookup function is *Choose*, which allows you to select one of a series of arguments in a list. The general form of Choose is:

CHOOSE(INDEX,ARG1,ARG2,ARG3,...)

Here, *index* refers to a value, cell, or formula (just as it does in Lookup), and the list of arguments that follows specifies the choices available. The list may include a range within it; in other words, you could have a formula like this:

@CHOOSE(B2,C9,D11,3092,Z26,H5...H14,Q1)

The list arguments may be cell references or numbers, and references may be to contiguous cells or not; list items may also be complex formulas, if you like. How you arrange the list is your business. Choose will evaluate the first argument, then count the appropriate number of items into the list.

For example, *Choose(5,2,4,6,8,10,12,14)* would display the number 10, since 10 is the fifth item in the list. Similarly, *Choose(3,B2,8,H12,7,5)* would return whatever value was stored at H12, since that cell reference is the third item in the list.

As an example of an application suitable for Choose, consider a printer who makes estimates on a variety of jobs. To help speed up estimation, he assigns an overall degree of difficulty to each job, which will raise the job estimate by a predefined factor:

Degree of Difficulty	**1**	**2**	**3**	**4**
	1.2	**1.5**	**2**	**2.4**

The figure 8 spreadsheet will multiply the job estimate, presumably calculated in another part of the sheet, by the appropriate factor.

	A	B	C	D	E
1	Estimate				
2	Difficulty				
3	Adj. estimate		CHOOSE(B2,1.2,1.5,2,2.4)*B1		

Figure 8.

To use the sheet in figure 8, enter an estimate at B1 and a degree of difficulty (between 1 and 4) at B2. Choose will then select the appropriate multiplier and apply it to the estimate, reporting the outcome at B3.

The index used to select the argument must be greater than or equal to 1 and must also be less than or equal to the number of arguments in the list. If the index is out of this range, then Choose returns NA. A difficulty factor of 0 or 5, for example, will cause our example Choose formula to return NA at B3.

Next month we'll move on to logical functions—*If, And, Not,* and *Or*.

Your questions and comments about spreadsheet applications are invited. Send them to Profit Plot, Softalk/IBM, Box 60, North Hollywood, CA 91603.

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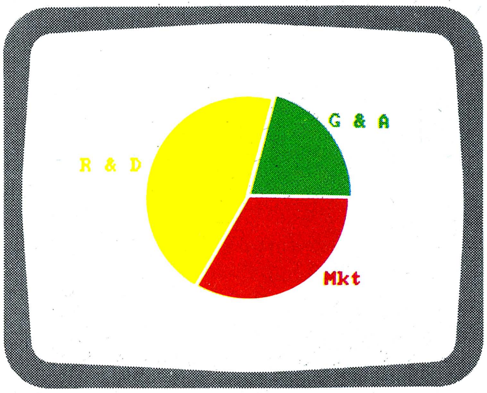

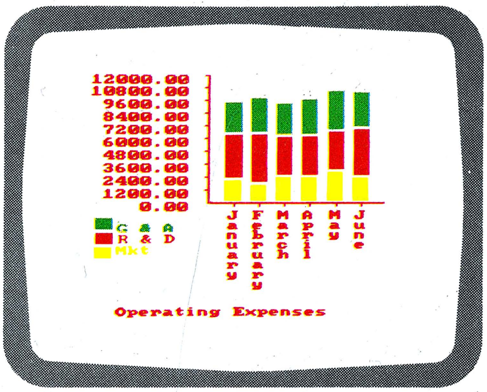

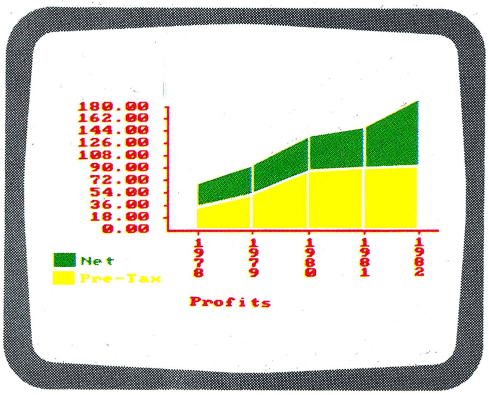

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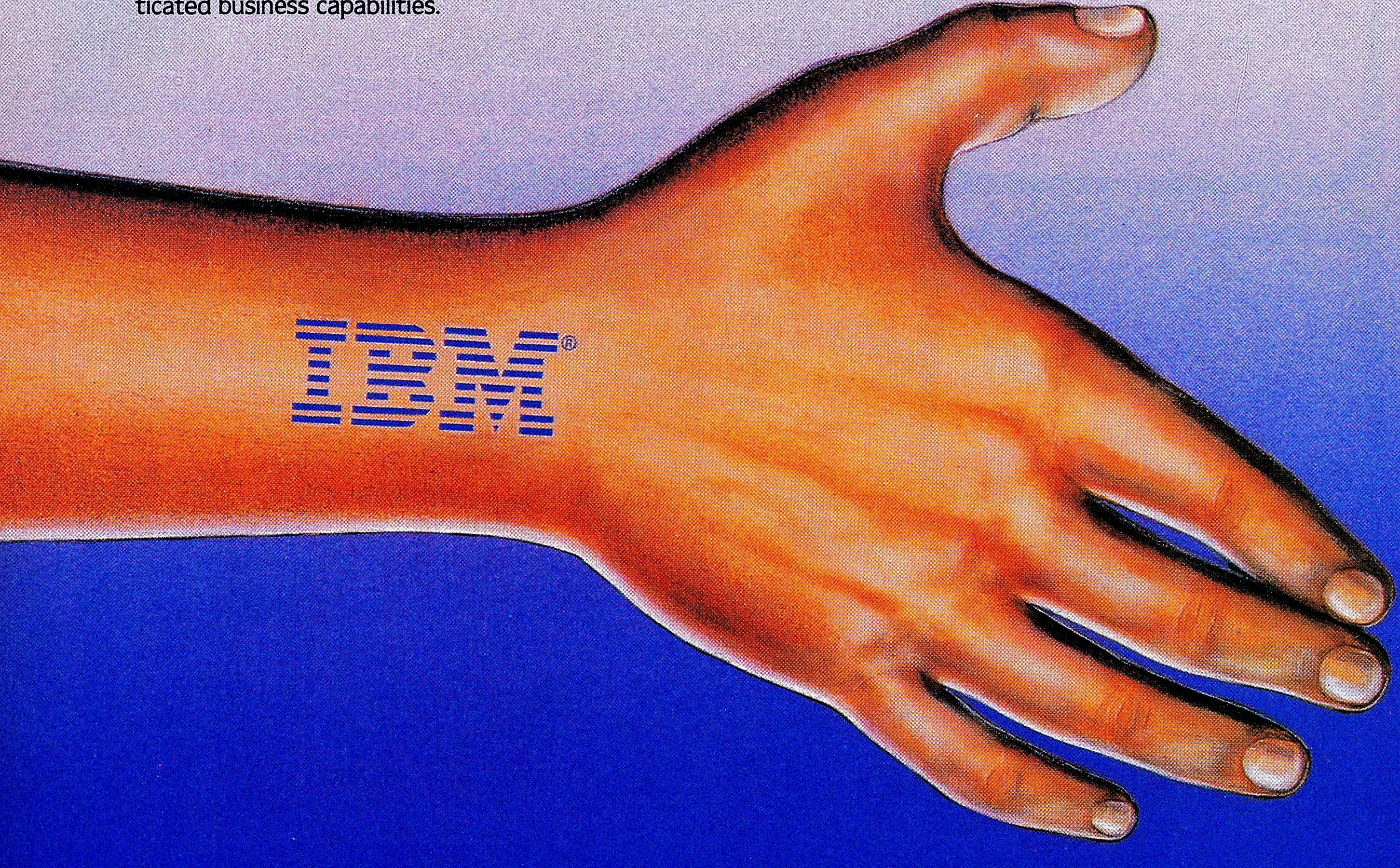

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How To Submit Software to Big Blue

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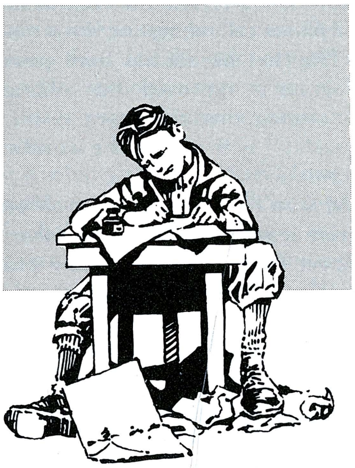

by Douglas Clapp

IBM's biggest surprise in the unveiling of the pc was its reliance on outside vendors. A multitude of respected hardware and software suppliers, from Intel to Tandon, contributed product to IBM for the pc.

The corporate giant made a giant shift in philosophy, then treated the change as obvious. "A personal computer, by definition, is a product of third-party vendors," said Philip Estridge, head of the project that developed the pc.

With 1983 pc sales projected at more than five hundred thousand units, a bonanza is in store for suppliers of pc components and software. IBM won't be the only company to cash in on the Personal Computer's success—earnings of all firms supplying IBM should skyrocket.

The "open door" philosophy was pushed to the limit when IBM announced its Software Submission Plan. Not only was Big Blue looking to the established names in microcomputerdom, it was holding the door open to anyone who could program a pc.

Insiders credited IBM with again making a savvy marketing decision: With pc sales zooming, there was an immediate need for quality software. Sales would come "up to speed" only when there was a wide selection of programs. IBM may have cast its eye at Apple Computer and noted that Apple II sales in 1982 (in excess of forty thousand units a month) were due in large measure to the huge base of Apple software.

America's software industry is exploding. Basement programmers take on VisiCorp and MicroPro, while the large firms themselves battle to write the top-selling word processor, database, or spreadsheet. Advertising is expensive and support is costly. Fortunes are made and risked daily.

For consumers with a limited budget for software, the hunt for good programs is often a costly trek through uncharted jungle.

To ensure a wide selection of enticing software, IBM played an ace in the hole, a card no other manufacturer can play: the letters *IBM*. The IBM logo would assure buyers that the world's premier computer corporation had given its blessing to the software it packaged.

Once again, everyone wins. Established software companies can let IBM handle marketing and watch the royalties roll in. For its part, IBM gets a chunk of a sale without any investment in program development and often gets the chance to market proven winners like *VisiCalc*. Programmers with a good product can do what they do best, while IBM, in effect, works for them.

Judging from IBM's previous releases, quality is the prime consideration. *VisiCalc* was an initial offering. *Multiplan* by Microsoft, another excellent spreadsheet program, is also marketed by IBM. Just as owners were given the choice between three operating systems—PC-DOS, CP/M-86, and the UCSD p-System—choices are being given in other software areas. The sentiment, simply, is that if it's good, IBM will market it.

The Software Submission Plan, since its inception in 1982, has undergone one important change. When first announced, the plan offered vendors royalties with a ceiling of $100,000.

Most of us would be perfectly happy to earn $100,000 for writing a computer program. But the software industry howled. "Only $100,000? What if we give you the next *VisiCalc?*" IBM would reap all profits once the ceiling was reached, went the cry.

IBM relented. The ceiling was eliminated. Payment for software is now negotiated on a case-by-case basis. Negotiable items include royalty percentages, duration of royalty payments, lump-sum payments, or advance payments. Royalties are a percent of IBM's wholesale price and are paid quarterly.

In charge of the submission program is the elegant, intelligent Vicki Fairchild, manager of product publishing. Fairchild smiles when the talk turns to numbers but says that elimination of the royalty ceiling has increased the number of submissions.

Although Fairchild declines to reveal the total number of submissions, others have speculated that most of the first pc sales went to programmers. That may be confirmed by Fairchild's comment that "most of the submissions have been business-oriented."

Most isn't all, however, and gamers and hackers can take heart in the diversity of programs IBM has received for consideration. "People continually open our eyes to creativity," Fairchild says, emphasizing the range of submissions that have poured through IBM's doors.

That range is already showing up in IBM outlets. *Casino Games, Personal Editor* (a full-screen editor), *Adventure in Serenia, Disk Librarian* (a utility), *Programming Development System, PFS:File* and *PFS:Report*, and household budgeting are among programs now available.

The path from inspiration to marketing is a careful sequence. The first step is requesting the *Software Submissions Guide* by writing to IBM Corporation, External Submission Department 765 PC, Armonk, NY, 10504.

The guide, itself a model of excellent documentation, explains the submission process and offers tips and suggestions to would-be programmers.

Packaged inside are two software submission agreements. Fairchild is quick to note that IBM wants *only* the agreement returned, not the actual program, code, or documentation. "The first step is selling us on the program," she explains.

"Selling" IBM consists of explaining the program's function, characteristics, hardware/software requirements, and targeting the program's intended users. Is the program now in use? Is it copyrighted? Who developed the program? Does anyone own rights? Information is also sought on the documentation, from reference cards to installation guides, that is offered with the program.

The agreement is thorough but shouldn't be intimidating. After all, we may be talking big money here, right?

Acceptance depends, in part, on the potential market. A program to aid in shearing Himalayan yaks, no matter how well written, probably won't get the nod from IBM. Although she won't discourage any submissions, Fairchild looks a bit wistful when she says, "We'd like to see more programs for the home."

The best way to have your program accepted is to "follow the suggestions in the guide." Those tips include making use of the pc's special features, including function keys, graphics, and the ability to work with both monitor cards. A program that works on a minimal system (one drive, 64K, DOS), may have a slight edge.

Also important is error checking. A program should be both easy to use and hard to "bomb."

The guide's documentation section even includes a sample outline to use in creating manuals. With typical thoroughness, this section also comments on the correct "tone," "voice," and "tense" to follow in writing instructions.

Good programmers aren't always good writers, as Fairchild concedes. "We do have a technical writer on staff for programmers that need help with their documentation."

If IBM is impressed, the programmer receives a phone call requesting the actual program. The first hurdle has been passed. If the program is approved, the programmer begins negotiations that may result in a "partnership" with one of the world's largest corporations.

IBM won't be pinned down on projecting future releases, but it appears that users can expect from one to five new program packages on a monthly, or almost-monthly, basis.

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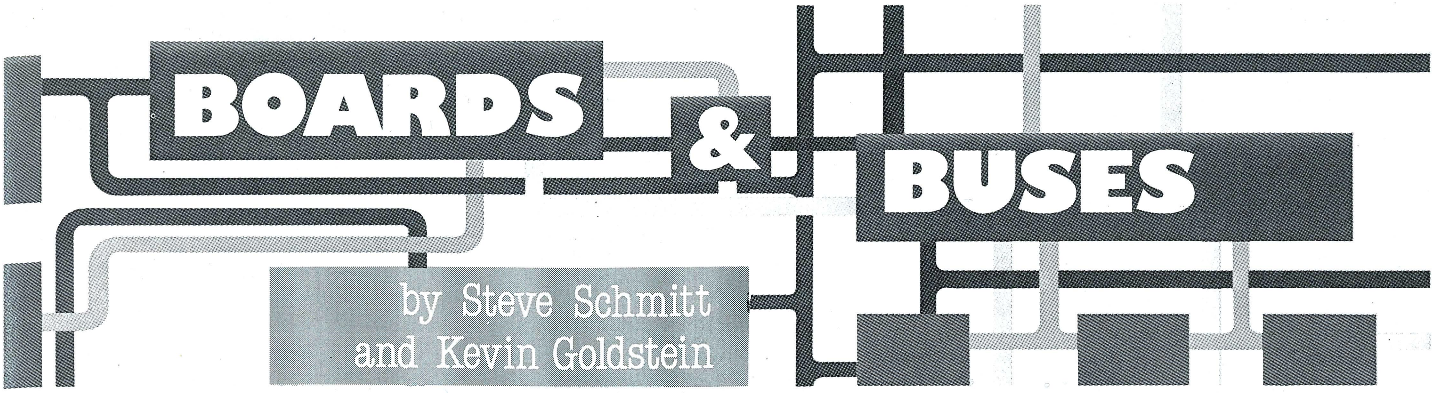

BOARDS & BUSES

by Steve Schmitt
and Kevin Goldstein

Masatoshi Shima, the designer of both Intel's 8080 and Zilog's sixteen-bit Z8000, appears to be hard at work again, this time designing a pc-on-a-chip. Shima's new chip will use a technology known as CMOS, an acronym that stands for *complementary metal-oxide semiconductor*. Like all really good acronyms, this one is pronounceable: see-moss.

And what good is CMOS? Intel's 8086 and 8088 are made of NMOS (n-channel metal-oxide semiconductor), as is the rest of the current crop of sixteen-bit microprocessors, from Motorola's 68000 to National's 16032. So why the switch?

The answer is simple: If Intel tried to cram all the functions of an entire pc onto a single bitty chip, it would be creating its own micro Three Mile Island; the chip would probably melt down the first time power was applied to it. When designers add functions to a silicon chip, they don't increase the chip size; instead, they pack more and more functions onto the same piece of silicon real estate. And just as a skyscraper in Manhattan will consume more power than a suburban house occupying the same amount of ground space, so a chip with more functions draws more power than a chip with fewer functions. Compared to CMOS, the NMOS process technology that the 8088 is made in is a real power hog. Trying to cram too many more functions onto it would make the chip too hot; and remember, heat is the enemy of electronic components. Thus the decision to go with CMOS, which can do the same work while burning only a small fraction of the power.

You might at this point be wondering why, if CMOS is so great, it wasn't used for the 8088. Because there aren't any free lunches, that's why. CMOS costs more than NMOS, so there's no sense using it unless its low-power advantages are needed. And it used to be much slower than NMOS, although rapid advances in R&D seem to be turning that situation into a piece of techno-history. CMOS right now has a "granny's tooth" market: There's a big hole in the middle. It's strong at the bottom, where it's almost universally used in battery-powered equipment, and it's coming on strong at the high-performance end, where its low power usage prevents melt-down in high-density chips and its extra cost extracts a proportionately smaller penalty. As for the middle of the market—the Z-80s to 8086s—it's likely that as time goes on, CMOS versions of popular microprocessors will be used more and more, as evidenced by the fact that at least one company has already announced a CMOS 8086. A few years from now, microcomputers will be using CMOS almost exclusively.

Riddle Department. A rumor that's been picking up steam lately is that IBM is starting to ship Peanut, a low-cost version of the pc, to beta test sites. If you're the kind that likes to put 2 and 2 together to get 22, consider this riddle: Peanut is rumored to be a portable. Portable microcomputers need CMOS. IBM owns 12 percent of Intel, which is designing a pc-on-a-chip using CMOS. Intel will shortly be introducing CMOS RAMs. Does it look to you like Big Blue is out to conquer yet another microcomputer market?

Building Blocks. Does that tidbit about a pc-on-a-chip pique your curiosity? Here's some more information. According to an article in *EE Times*, a technical newspaper for

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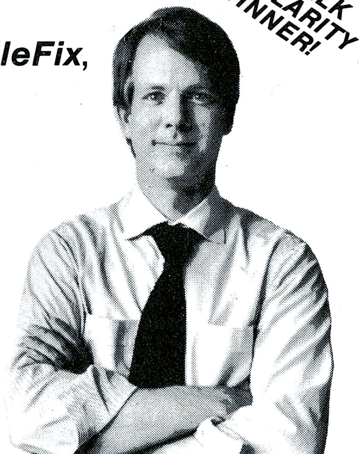

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engineers, the chip will be put together building-block style. First, all the functions that will eventually end up on the chip will be defined and built as individual chips—graphics controllers, communications interfaces, disk controllers, and so forth. Then to build the pc-on-a-chip, the proper functions will simply all be put on one chip, much as you now pick and choose different boards and put them all in your system unit. The analogy is apt, since the different functions (also called modules) will communicate with each other via a "silicon system bus" on the chip, similar to the way the different cards in a pc communicate over the system bus. The obvious advantage of such a modular design is flexibility: put one set of functions on a chip and you've got a pc; pick another set and you might be able to get a chip that emulates—meaning is functionally equivalent to—an Apple.

Speaking of Talking. Shortly before press time, we received some indications that IBM is taking telephone management systems like that introduced by Texas Instruments for its Professional Computer or Tecmar for the pc (see Comm Lines, this issue) quite seriously. Apparently the company thinks such systems will be vital elements in the "pc-as-productivity-tool" scheme. That means it's only a matter of time before Big Blue will be introducing its own telephone management hardware. The time frame is likely to be pretty short, considering the speed with which IBM has managed to react to the market. (Who says giants lumber?)

Another item that slides in somewhere between unsubstantiated rumor and unconfirmed fact is that IBM is working on its own operating system for its microcomputers. The industry talk is that it will be somewhat similar to IBM's VMS system, which runs on the big IBM machines. The OS war is really a hot one: Western Electric recently announced that it has entered into a software-development arrangement with Intel, Motorola, and National Semiconductor to produce versions of its highly acclaimed Unix for the companies' microprocessors. (Zilog has spent a lot of time and money developing Unix on its own for the Z8000.) Western Electric won't be offering Unix for the 8088, however; current plans slate Unix only for Intel's higher-performance 80286. Sritek (Cleveland, OH) is making a 286-board for the pc; don't be surprised if it turns out to be a popular add-on.

If you really want to change the personality of your pc, however, how about Quadram's Quadlink, a 6502 processor board that turns your pc into an Apple. It can even read Apple disks. Between that and other cards that let you drop in 68000 microprocessors or 16032 microprocessors, the poor pc could soon become hopelessly schizophrenic.

Of Hard Disks and System Integration. As a builder and seller of mainframes, IBM is what is known as a vertically integrated company; that is, it builds practically all of the parts for its products, from the smallest memory chips on up to gigabyte-capacity hard disk drives. (A gigabyte is a thousand megabytes; IBM's gigabyte hard disk looks a lot like a 5¼-inch Winchester with elephantiasis.) That's okay in the mainframe business, where things move more slowly than they do in the personal computer market; had IBM attempted the same strategy with its Personal Computer, however, it wouldn't have been able to move fast enough to keep up with the microcomputer market. That's why IBM chose to buy out most of its major subassemblies, from color terminals and disks to the operating system and application software. The pc is really a conglomeration of hardware and software from various companies, which IBM packages together to make the pc. In the electronics industry, companies that build products primarily by integrating subsystems built by others are called, reasonably enough, system integrators; when it comes to pcs, IBM is a system integrator.

IBM's offering of a hard disk drive in the pc XT adheres to the formula the company proved with its original XT. IBM buys the hard disks from two different companies. Approximately 70 percent of the XTs appear to have drives from Seagate; the rest are made by Miniscribe. Being able to buy functionally equivalent subsystems from more than one supplier is an especially important factor to system integrators; it means that if one company can't supply sufficient product, goes belly up, or has quality problems, there's another company available to take up the slack. The concept is known in the industry as second-sourcing. The disk-drive controller cards come from yet another company, Xebec. Xebec's 1410 hard disk controller is highly regarded by the electronics industry; it includes a host of error-checking hardware and firmware designed to prevent the type of errors that can creep into systems with the high bit-rates common to hard disks.

The Xebec controller card uses an industry standard disk drive interface protocol known as SASI, which can be connected to drives from a variety of manufacturers. Since DOS version 2.0 provides support for hard disks of five, ten, fifteen, and twenty-five megabytes, adding a new hard disk should be a very simple task: Simply set a couple of switches on the controller board.

Incidentally, it appears that pc shipments are slow right now because disk controller cards are in short supply. That's an excellent example of the danger of depending on subsystems that are not second-sourced. ▲

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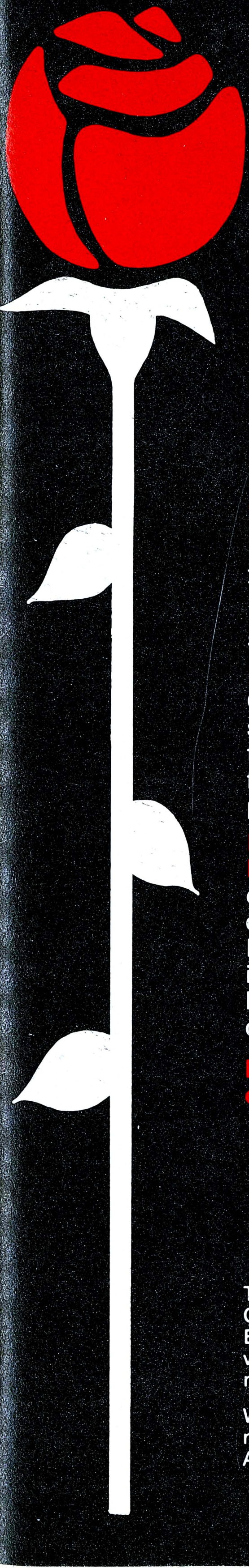

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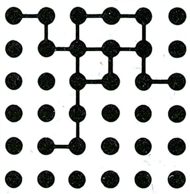
Part One

A PRIMER ON NETWORKING



by Bruce Churchill

The following is the first in a series of articles excerpted from the book Communications and Networking for the IBM PC, *by Larry Jordan and Bruce Churchill, to be published this month by the Robert J. Brady Co.*

Local area networking is a term that describes a form of computer communications generally used to transfer data internally in an organization. Internally, in this context, means within the confines of an office, a group of offices, a building, or a closely spaced group of buildings.

In its most elementary physical form, a local area network (LAN) is two or more computers connected together by some type of wire or cable; the wire or cable forms a data path between the computers. Once established, a local area network allows the exchange of program and data files among users connected to it. Such a network also allows users to send files to a printer or a hard disk attached either to another computer or directly to the network.

What benefits do local area networks offer for business applications?

First, local area networks allow the sharing of expensive resources—such as letter-quality printers and high-capacity hard disk drives. Second, local area networks allow the high-speed exchange of essential information between key people in an organization. If properly done, this sharing promotes greater efficiency and productivity and leads to more sophisticated computer applications, such as electronic mail. Finally, local area networks act as a catalyst to increase the range of potential applications for the personal computer.

Figure 1 illustrates a simple local area network. The printer and hard disk are shared resources, since all of the users have access to them. The hard disk in this example is attached to the network as a separate device through an interface box; it's also possible to attach the hard disk directly to one of the personal computers, just the way the printer is attached in figure 1.

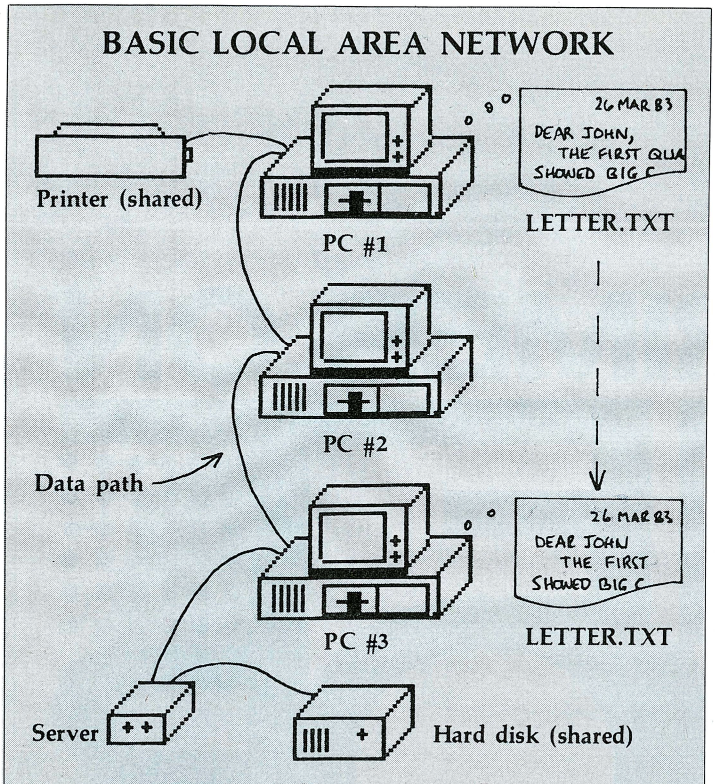

BASIC LOCAL AREA NETWORK
Printer (shared)
PC #1
26 MAR 83
DEAR JOHN,
THE FIRST QUA
SHOWED BIG C
LETTER.TXT
PC #2
Data path
PC #3
26 MAR 83
DEAR JOHN
THE FIRST
SHOWED BIG C
LETTER.TXT
Server
Hard disk (shared)

Figure 1.

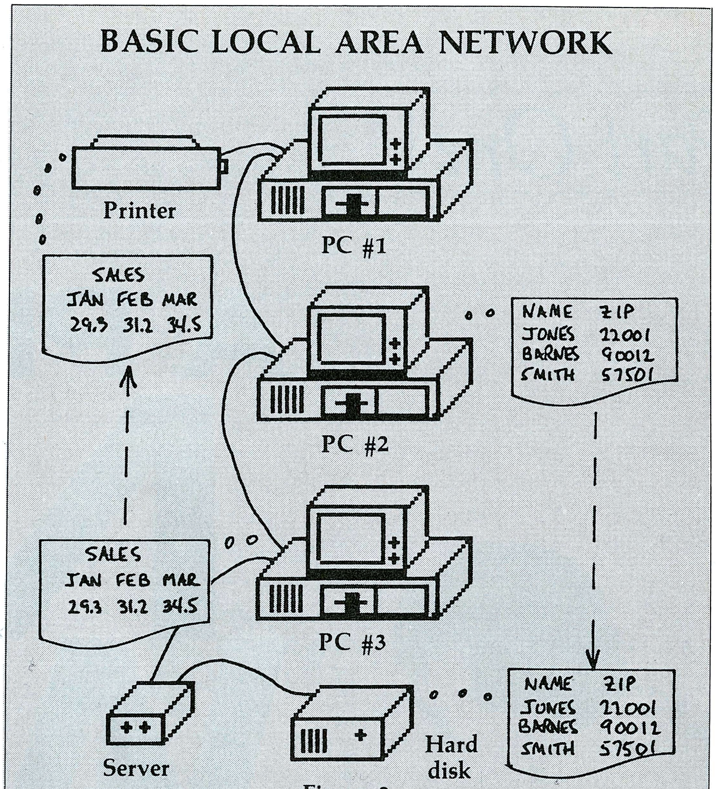

BASIC LOCAL AREA NETWORK
Printer
PC #1
SALES
JAN FEB MAR
29.3 31.2 34.5
NAME ZIP
JONES 22001
BARNES 90012
SMITH 57501
PC #2
SALES
JAN FEB MAR
29.3 31.2 34.5
PC #3
NAME ZIP
JONES 22001
BARNES 90012
SMITH 57501
Server
Hard disk

Figure 2.

Figures 1 and 2 show two types of logical processes that may occur in a local area network. Figure 1 depicts a user at pc #1 sending a word processor file to a user at pc #3. This file transfer could have been initiated by either user. The user at pc #3 can interact with the file as if it had originated at his own pc; he can, for example, write the file to a local floppy disk or use it as input to a word processor.

Figure 2 shows a user on pc #3 printing a file at the printer attached to pc #1. It also shows a user on pc #2 storing a locally created file on the remotely connected hard disk. An interesting consideration relating to pc #1 in figure 2 is the degree to which network software will allow that computer to support a local user and at the same time control access to its attached printer. We'll return to this subject later.

Theme and Variations. There are two ways to look at a local area network: as communications technology and as a multiuser computer installation. Before we go further in our discussion of LAN fundamentals, it would be useful to characterize LANs in the context of other communications systems and other types of multiuser data-processing systems.

Two primary characteristics of LANs distinguish them from modem networks, such as Telenet, Tymnet, Arpanet, and the public telephone system. First, LANs are designed to work in a restricted geographic area, generally limited to thousands of feet or closely spaced building complexes; and second, LANs operate at relatively high speeds, compared to the typical modem networks currently in use.

LAN data-transfer speeds may be as high as fifty million bits per second (fifty megabits per second), or slightly more than six million characters per second (rates of one to ten million bits per second are more typical). Compare this to the maximum data-transfer speeds of fifty-six kilobits per second (seven thousand characters per second) for high-grade telephone company digital trunk lines, or the 300/1200 baud (30/120 characters per second) transmission speed typical of most personal computer communication systems. At the higher speeds,

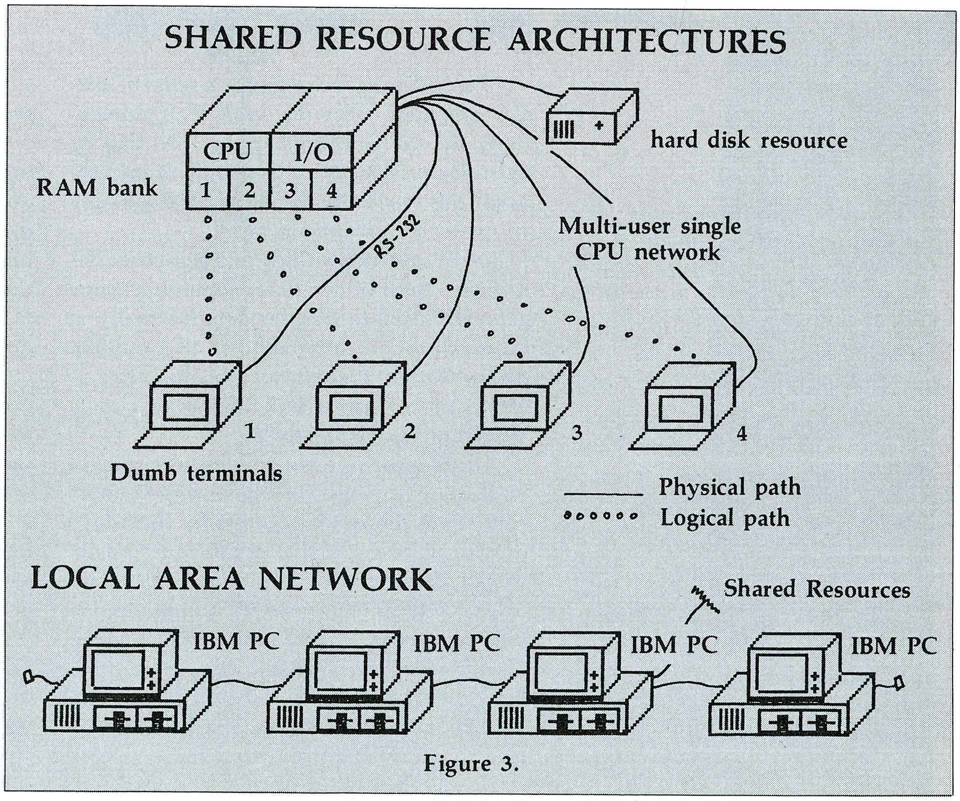

SHARED RESOURCE ARCHITECTURES
CPU
I/O
RAM bank
1
2
3
4
RS-232
hard disk resource
Multi-user single CPU network
1
2
3
4
Dumb terminals
Physical path
Logical path
LOCAL AREA NETWORK
Shared Resources
IBM PC
IBM PC
IBM PC
IBM PC

Figure 3.

LANs operate at a rate exceeding that at which many current microprocessors conduct data transfers to and from random access memory.

As multiuser data processing installations, LANs are a logical alternative to the "classic" multiuser system. The latter usually consists of a central processing unit, several terminals connected to the CPU, and a multiuser operating system, such as MP/M-86, Oasis-16, or Xenix. Terminals in a traditional multiuser system are generally not capable of standalone data processing; instead they rely on the central computer to assign a portion of its main memory to, and execute applications for, each terminal's user.

In contrast to the traditional multiuser setup, each workstation in an LAN is an independent, standalone computer, capable of executing its own applications programs. Both types of systems—LAN and traditional multiuser—can reduce peripheral costs by allowing users to share such resources as printers and hard disks.

The physical differences between a single-CPU multiuser system and a local area network are illustrated in figure 3. Terminals on a single-CPU system are physically connected to serial input/output ports on the central computer, and their users are usually assigned specific segments of main memory for program execution and data storage (because these terminals are not standalone computers, they're sometimes called "dumb" terminals). Users in a single-CPU system are typically assigned their own private areas of a shared hard disk for mass storage. (Each user in an LAN may also be assigned private mass-storage space on a hard disk.) The combination of a dumb terminal, its assigned area of main memory, and its share of the CPU execution time is functionally equivalent to a single workstation on a local area network.

The Basic Components. Now for some more details about the LAN setup shown in figure 1. Bear in mind that this is a very simple LAN; much more complex ones are possible, but this one illustrates the fundamental concepts.

The hardware components of this network system are three IBM Personal Computers, a printer attached to pc #1, and a hard disk unit. Each pc has an adapter card in one of its peripheral slots; this card goes by a number of different names, depending on which vendor produced it. Some of the more common names for such a card are network adapter card, bus interface unit, and communications interface unit. Whatever its name, this card functions in this network in much the same way that an RS-232 card functions in a modem network.

The network data path is commonly formed by a coaxial cable similar to that used on a 75-ohm television antenna (one of the two common types of antenna cable). Some systems use a cheaper means of data transport—the twisted-pair wire similar to that used in telephone installations.

The usual method of making connections between each of the pcs and the data path is by means of standard T-connectors on the backs of the adapter cards, as shown in figure 4.

Before we go further, let's stop to assimilate some vocabulary. The pcs and the hard disk interface shown in figure 1 are known as network devices, or nodes. In general, each device or node is connected directly to the network cable, or data path.

LOCAL AREA NETWORK HARDWARE (Typical)

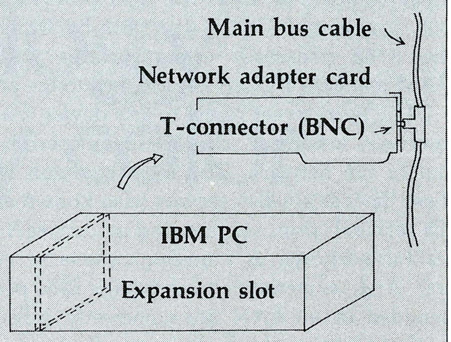


Figure 4.

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The terms transmission medium (plural media) and bus are commonly used synonyms for data path. The word bus appears in other contexts as well; the IBM pc system bus, for example, is the data path by which the 8088 processor communicates with RAM and with I/O devices attached to the pc.

The term server refers to any device that interfaces a non- or semi-intelligent peripheral to the network. The most common of these devices are disk servers (also known as file servers), print servers, and modem servers (also known as communications servers). And, as mentioned before, the IBM pcs included in an LAN are commonly called workstations, particularly in an office automation context.

The body of rules allowing an orderly, reliable transfer of data among all the network devices is known as a protocol.

The terms transparent and virtual are often used in discussions of local area networks. A process is transparent if it exists but does not appear to; a process is virtual if it doesn't exist but appears to. For example, a virtual memory process writes text to a floppy drive when the RAM text buffer overflows; a word processor operator enjoying the use of virtual memory may not know when internal memory has been used up. Another use for the term virtual is illustrated by the single-CPU multiuser installation shown in figure 2. That combination of terminal, RAM segment, and CPU time slice for a single user forms a virtual workstation.

LAN data movement is a good example of transparency: It obviously occurs, but how it occurs is not apparent to the LAN user.

The term throughput refers to a measure that describes the quantity of useful data that can be moved by a local area network in a given time interval. Contrast this with the term data rate, which merely means the rate of speed at which data moves on a network.

The term multiuser, in this discussion, refers to configurations of several users sharing a common CPU, central memory, and set of I/O devices. The term could, of course, also describe a local area network, but we'll restrict its meaning here in order to distinguish single-CPU setups from LANs.

Multitasking is the sharing of a single CPU by more than one process; the term concurrent is sometimes used as a synonym for multitasking.

One more term: direct memory access (DMA). This is an important concept, because direct memory access is commonly used in local area networks. Simply stated, direct memory access allows input/output devices to conduct data transfers directly to RAM, without CPU intervention. In the context of local area networks, the I/O device is the pc's network adapter card, which contains the logic chips necessary to conduct DMA data transfers. DMA is a prerequisite for the high-speed operations typical of local area networks.

High-Speed Data Movement. One of the major factors characterizing local area networks, as you already know, is the speed at which data moves on the network. Table 1 contrasts the speed of a one megabit per second LAN with speeds of other forms of data movement to and from, or within, an IBM pc. The important thing to notice here is that the speed of network data movement is on the same order of magnitude as that of data movement within a computer (that is, when you take into account the fact that parallel transfers use eight data lines simultaneously).

The fact that internal data transfers occur even a little faster than data transfers across the network, however, necessitates the buffering, or temporary storage, of data on its way into the network. It is the job of the network adapter card to compensate for data-rate and throughput mismatches.

As you'll note in table 1, the Ethernet protocol allows a considerably faster rate of data flow than other systems; this is a topic to which we'll return in a subsequent article.

Network Data Movement (Data Structure). Since the network shown in figure 1 must distribute processing and data-storage tasks among a number of users who may require near-simultaneous access to the network, data flow must be structured in a controlled manner. Control implies an orderly means of allowing each device access; it also implies a degree of service that allows data to arrive at its destination virtually error-free and in the same sequence it was transmitted.

A prerequisite to logical network control is the placement of data streams into formatted packets, which are then transmitted in accordance with network protocol.

The demands on a local area network system follow the irregular patterns of individual-user processing requirements. The irregularity, or randomness, of data transmission associated with these demands constitutes a form of data transfer called bursty communications. Network speeds are designed so that system demands, such as requests for file access, are fulfilled with no apparent delay attributable to the network itself. This type of system design, incorporating random bursts of data packets traveling at high speeds, is in stark contrast to what usually happens on modem network communication systems. Communications over a modem network are limited by the low-speed capability of that network; thus

Transfer Type	Operation	Typical Maximum speed (megabits/sec)
Serial	Network data flow	1.0/10.0*
Parallel	RAM read/write	9.5
Parallel	DMA transfer	9.5
Parallel	Processor-initiated I/O	7.6
Parallel	Hard disk I/O	6.5–8.0
Parallel	Floppy disk I/O	0.25
Serial	Multiuser terminal (RS-232)	0.0192
Serial	Modem at 1200 baud (RS-232)	0.0012

**Ethernet*

Table 1. Data transfer rate comparison

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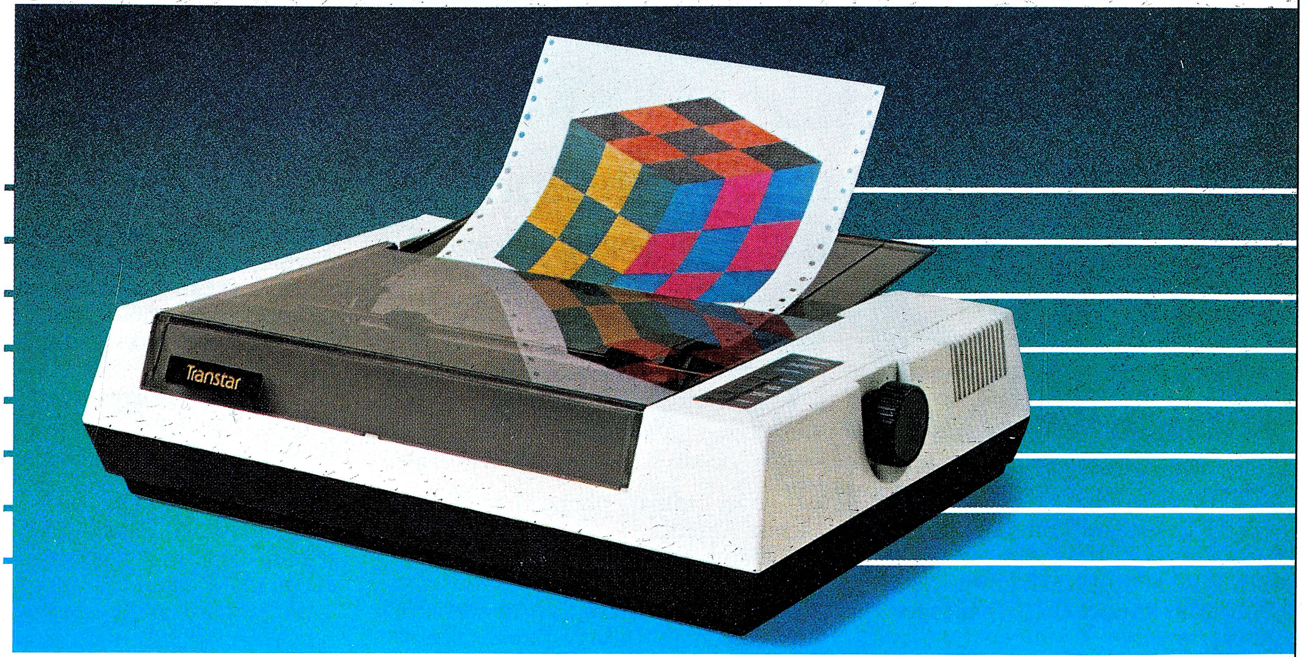

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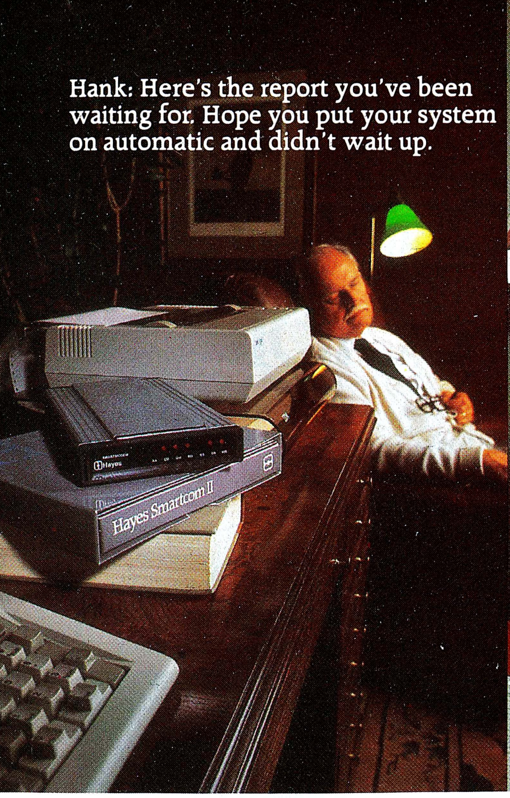
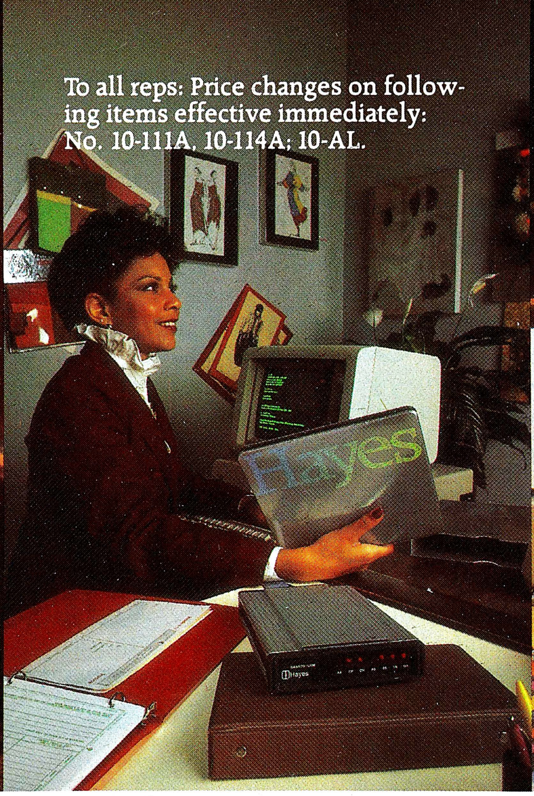
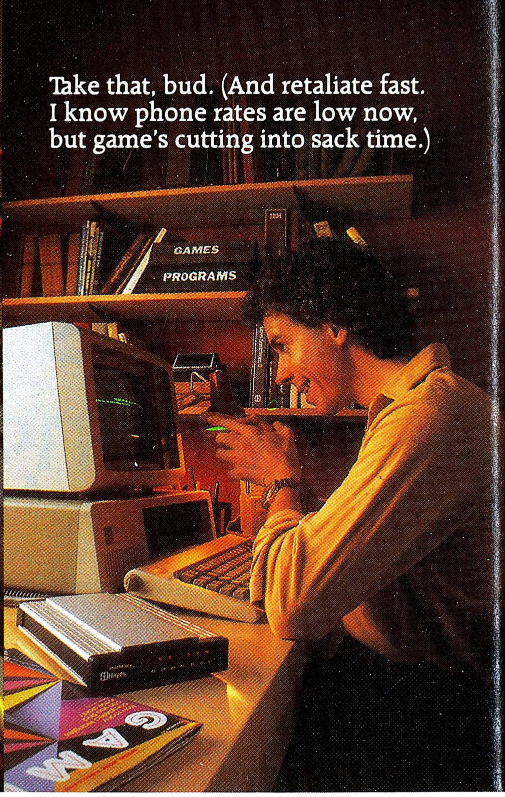

Hank: Here's the report you've been waiting for. Hope you put your system on automatic and didn't wait up.
Hayes Smartcom II


To all reps: Price changes on following items effective immediately: No. 10-111A, 10-114A; 10-AL.
Hayes


Take that, bud. (And retaliate fast. I know phone rates are low now, but game's cutting into sack time.)
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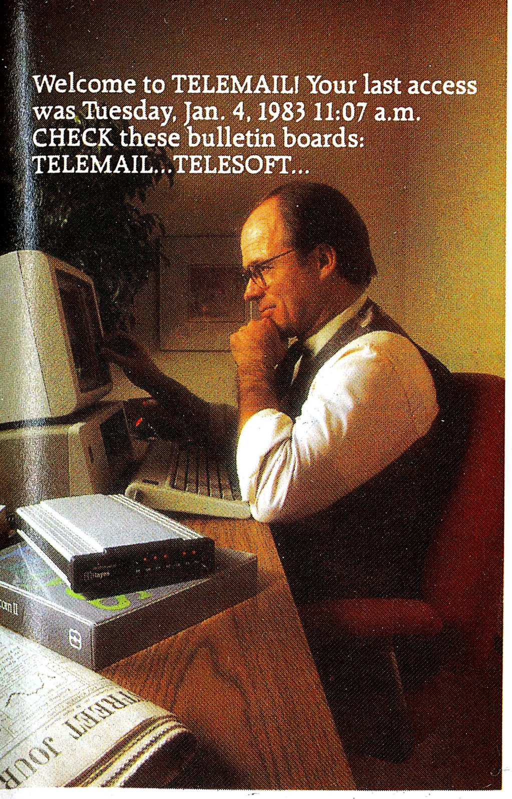
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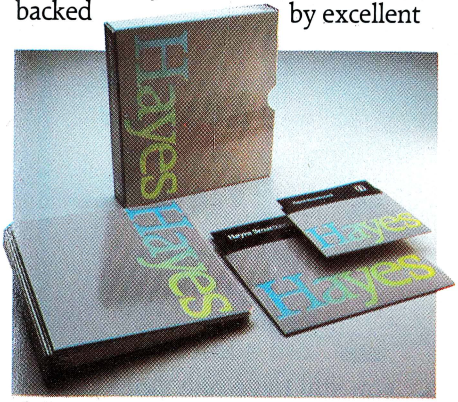
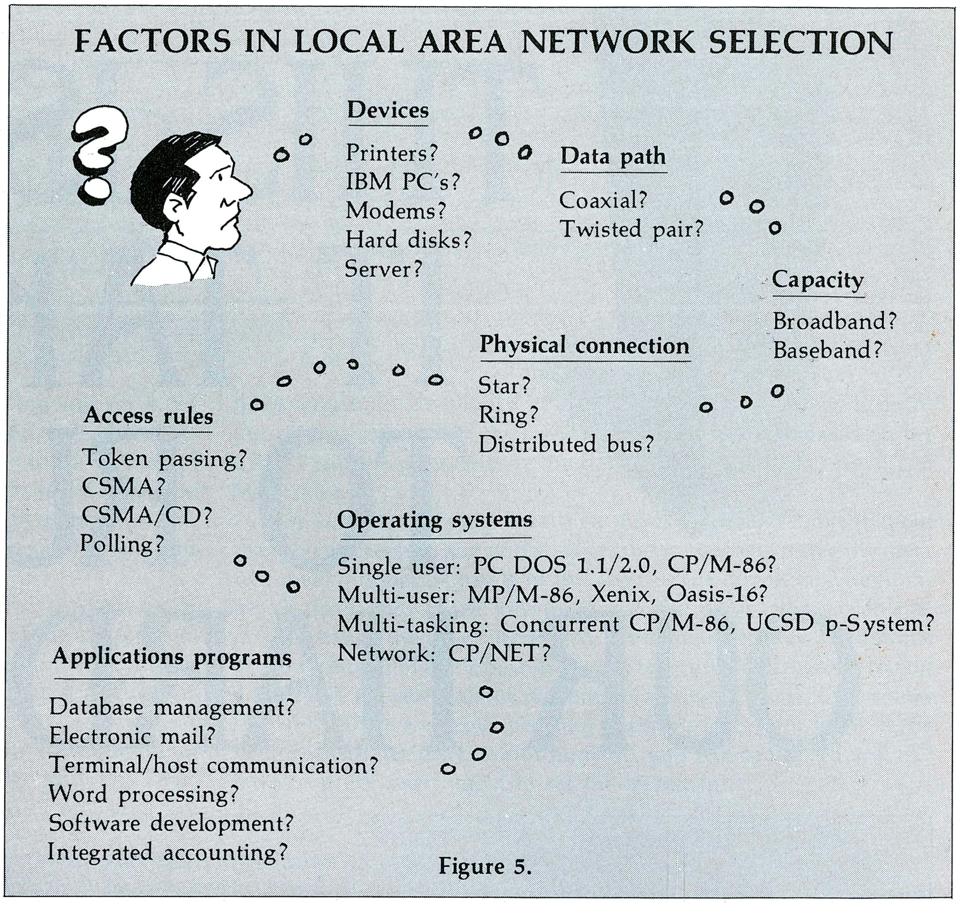




FACTORS IN LOCAL AREA NETWORK SELECTION

Devices

Printers?
IBM PC's?
Modems?
Hard disks?
Server?

Data path

Coaxial?
Twisted pair?

Capacity

Broadband?
Baseband?

Physical connection

Star?
Ring?
Distributed bus?

Access rules

Token passing?
CSMA?
CSMA/CD?
Polling?

Operating systems

Single user: PC DOS 1.1/2.0, CP/M-86?
Multi-user: MP/M-86, Xenix, Oasis-16?
Multi-tasking: Concurrent CP/M-86, UCSD p-System?
Network: CP/NET?

Applications programs

Database management?
Electronic mail?
Terminal/host communication?
Word processing?
Software development?
Integrated accounting?

Figure 5.

modem network sessions tend to be continuous in nature and typically last for at least several minutes, tying up a communication channel for the duration of the connection.

LANs and Distributed Processing. Once a local area network is physically assembled and the communications rules are established, some interesting challenges present themselves. These concern the concepts and rules by which the shared resources will operate.

One obvious problem concerns access to the hard disk drive: Which user has priority and how are multiple requests to access data from the same open file or files arbitrated? The answers lie more in how the accompanying software (the operating system or applications program) is designed than in the mechanics of data movement from point to point on the network.

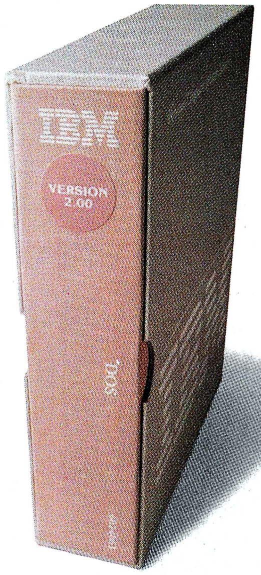
One popular way of handling the matter is to partition the hard disk drive and assign a segment to each specific user. Each segment can contain several files, which will then be accessed just as a user accesses floppy disk files. We'll refer to such segments as volumes and consider them logically equivalent to floppy disks.

Another design challenge in local area networks is the handling of requests for floppy disk or printer access from the network while the pc workstation to which these devices are attached is in use by its operator. This situation is best handled by interfacing the network to multitasking or multiuser operating systems on the host pc; examples of these operating systems are Concurrent CP/M-86, MP/M-86, or the UCSD p-System. Existing solutions range from not allowing local use of a pc when it provides a shared device to not using a pc for attaching such shared resources. Prospective users should investigate carefully the operating systems that a particular network will support, as well as any restrictions in the use of a network pc as a shared resource.

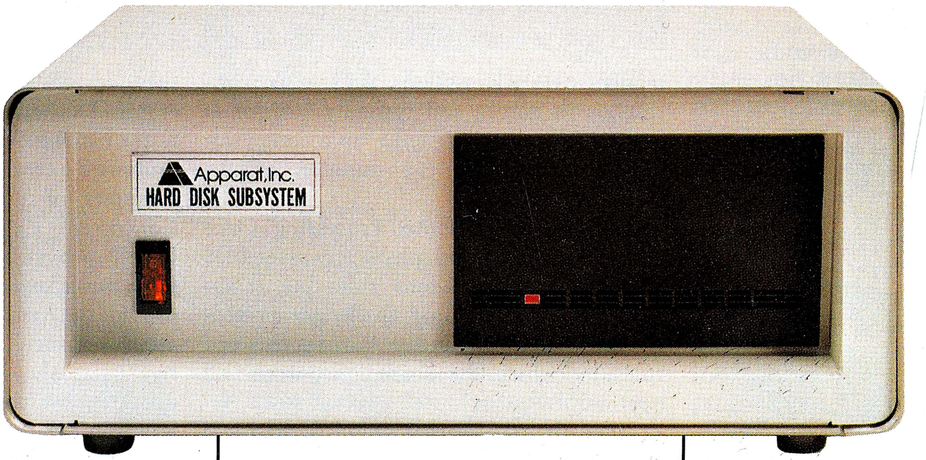
Obviously there are a good many considerations that go into the choice of a local-area-network configuration. Some of the key decisions concern the operating system or systems to be used, the design of applications programs to exploit the power of local networking, the amount of mass storage to include, and the need for modems and modem network resources. Another—more fundamental—decision must be made by the cost-conscious business user: whether to use an LAN at all or to go with a multiterminal, multiuser, single-CPU system.

The relevant variables to consider in selecting a local area network are summarized in figure 5.

Next month's installment will take up the subjects of capacity, types of physical connection, and access rules.—Ed. ▲



THIS IS ALL IT TAKES TO RUN OUR HARD DISK.



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THE BASIC SOLUTION

BY JOE JUHASZ

Most video games get the player involved in moving some object about the screen. This movement is usually controlled by a joystick. You can hook up a joystick to the IBM Personal Computer, but you must first purchase a game adapter. For those wishing to do a little game programming without the game adapter, we offer this month some Basic code to allow you to control an object by means of the pc's cursor keys.

There are four cursor keys on the IBM keyboard. We'll create four more to allow us diagonal movement as well as the usual north, south, east, and west. The diagonal moves will be controlled by the corner keys on the number pad. Finally we'll include a mechanism for controlling the distance, or move increment.

Advanced Basic is capable of trapping the four standard cursor keys by means of the *on key(n)* statement. Our diagonal cursor keys, however, cannot be trapped in this manner, so we'll create a little input routine to examine the keystrokes; this routine is based on the CKkey routine presented in the Basic Solution, *Softalk*, April and May 1983.

For our example we'll draw a *Pac-Man* figure and move it about the screen. Pressing any of the eight cursor keys will move the creature a set number of pixels in the appropriate direction. The number of pixels moved per keystroke is controlled by the variable *X*.

To change the move increment, press the insert key and hit one of the number keys (it's best to use the top-row number keys so you don't have to worry about the numlock toggle). Increment values from 0 to 10 are available; pressing 0 sets the increment to 10. If the key pressed after insert is not numeric, you will be beeped and will have to press insert again to set the increment.

```
100 '***---General Housekeeping---***
110 DEFINT A-Z                                    '-Make all variables integers
120 KEY OFF: FOR I=1 TO 10: KEY I,"": NEXT        '-Turn off function keys
130 GOSUB 450                                     '-Switch monitors
```

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```
140   COLOR 17,0                                              '-Set background and palette
150   GOSUB 530                                               '-Initialization
160   GOSUB 760                                               '-Draw original picture
170  '
180  '***---get & test a keystroke---***
190   CK$=INKEY$:                    IF CK$=“” GOTO 190       '-Wait for a keystroke
200   IF ASC(CK$) <> 0          THEN BEEP: GOTO 190           '-We want a two-byte scan code
210   TCKI = ASC(RIGHT$(CK$,1))
220   IF TCKI>82 OR TCKI<71 THEN BEEP: GOTO 190               '-We want cursor or <Ins>
230  '
240  '***---process keystroke---***
250   IF TCKI<>82 GOTO 310                                    '-If not<Ins> then a cursor
260   '**-- <Ins>  key
270     CK$=INKEY$: IF CK$=“” GOTO 270                        '-Wait for next key
280     IF CK$<“0” OR CK$>“9” THEN BEEP: GOTO 190             '-We want a digit
290     IF CK$=“0” THEN INC=10 ELSE INC=VAL(CK$)              '-If 0 then make 10
300 GOTO 190                                                  '-Go get next key
310   CKEY=TCKI−70                                            '-Get cursor key #
320   GOSUB 340                                               '-Go process cursor key
330 GOTO 190                                                  '-Get next key
340 '***---set to move cursor---***
350   X.LOC=X.LOC+X.INC(CKEY)*INC                             '-Move in X direction
360   Y.LOC=Y.LOC+Y.INC(CKEY)*INC                             '-Move in Y direction
370   '*-if move would take off screen then ignore-*
380   IF X.LOC<X.MIN OR Y.LOC<Y.MIN OR X.LOC>X.MAX OR Y.LOC >Y.MAX THEN X.LOC=X.LST: Y.LOC=Y.LST: BEEP:
      GOTO 190
390   '*-erase old cursor
400   PUT (X.LST,Y.LST),PIC.ARRAY, XOR
410   '*-move cursor
420   PUT (X.LOC,Y.LOC),PIC.ARRAY,XOR
430   X.LST=X.LOC: Y.LST=Y.LOC                                '-Save current location
440 RETURN
450 '<==================== Switch to Color Graphics Monitor =====================>
460   DEF SEG=0: I=PEEK(&H410): POKE &H410,(I AND &HCF) OR &H20
470   WIDTH 40: LOCATE ,,0,6,7
480   SCREEN 0: SCREEN 1,0: COLOR 1,1
490   CLS
500 RETURN
510 '
520 '<============================================================>
530 '***---Initialization---***
540    TRUE=−1: FALSE=0
550    INC=1                                                  '-Start INC at 1 pixel
560   '* ------------------------------*
570   '*-  Define cursor keys and <Inc>  -*
580   '*-                                -*
590   '*- get second-byte scan code from  -*
600   '*- Appendix G−7                    -*
610   '*-                                -*
620   '*- X.INC, Y.INC set up to hold the -*
630   '*- increment in each direction.    -*
640   '* ------------------------------*
650   FOR I=1 TO 9: READ FKEY.A1(I): NEXT
660      DATA 71, 72, 73, 75, 77, 79, 80, 81, 82
670   DIM X.INC(11), Y.INC(11)
680   FOR I=1 TO 11: READ X.INC(I), Y.INC(I): NEXT
690     DATA −1, −1, 0, −1, +1, −1
700     DATA 0, 0, −1, 0, 0, 0
710     DATA 1, 0, 0, 0, −1, 1
720     DATA 0, +1, +1, +1
730   DIM PIC.ARRAY(600)                       '-Array to hold object being moved
740 RETURN
750 '
760 '***---draw original picture---***
770   CLS
780   PI=3.141593
790   CIRCLE (100,100),12,2,−.5*PI/2,−1.8*PI       'Draw Pac-Man
800   PAINT (95,100),2,2                           'Paint him in
810   PSET (98,94),3: PSET (102,94),3              'Draw his eyes
820   '**-- Set upper left-hand corner of picture
830   X.LOC=88: Y.LOC=88: X.LST=X.LOC: Y.LST=Y.LOC
840   '**-- Set height and width of picture
850   X.WIDTH=24:              Y.HEIGHT=24
860   X.MIN=1:                 Y.MIN=1
870   X.MAX=319−X.WIDTH: Y.MAX=199−Y.HEIGHT
880   '**-- Get picture --**
890   GET (X.LOC,Y.LOC)−(X.LOC+X.WIDTH,Y.LOC+Y.HEIGHT),PIC.ARRAY
900 RETURN
```

▲

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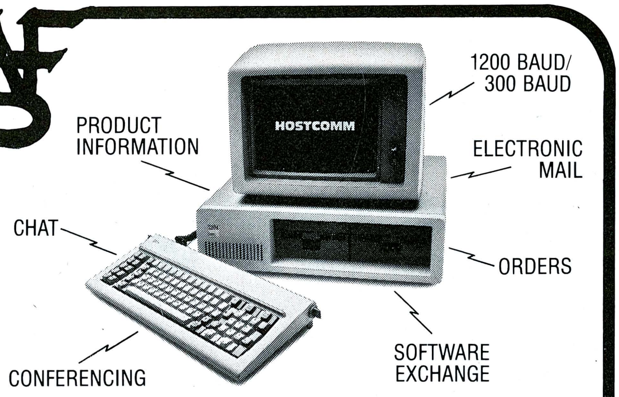

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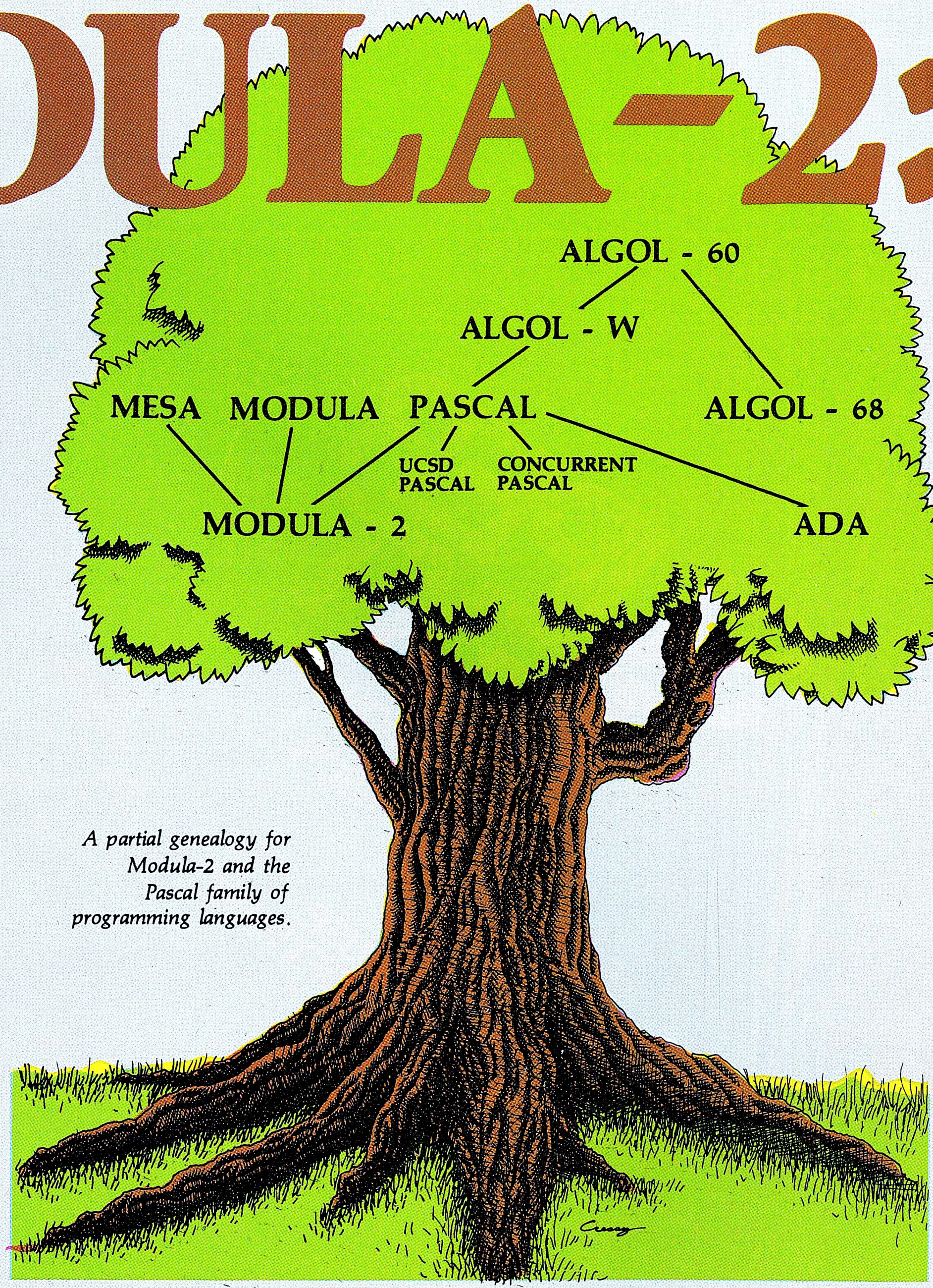
MODULA-2: ALTERNATIVE TO ADA?



A partial genealogy for Modula-2 and the Pascal family of programming languages.

by Allen Munro

Even as hardware costs plummet, the price of software soars. Some highly specialized software packages for computers of the IBM pc class already cost more than the machines they run on. Pundits have long predicted that computers would some day be included at no extra charge with the purchase of software packages; now that day has arrived. MicroPro International has announced that purchasers of the Apple II version of *WordStar* will be given a free Z-80 coprocessor with its own 64K memory bank.

The precipitous decline of hardware prices is cause for rejoicing among personal computer users, but cheap hardware alone is of no value without useful and affordable software. What can be done to put the brakes on runaway software development costs?

A new programming language, Modula-2, offers hope for improving productivity in software production.

For a time it was thought that program generators would facilitate lower-cost software development. Program generators are complex programs that query users about their new applications and then generate code to meet their needs. Examples of program generators include last year's much-advertised *The Last One*. Thus far, the hopes for program generators have not been realized. Some program generators seem reasonably well suited to the requirements of a limited-application environment, but they haven't proven to be a general solution to the programming productivity problem.

Other efforts to reduce the cost of software focus on the design of superior programming languages. Languages, like computers, must be designed. Different language designs can have the effect of enhancing different features of the programs written in those languages. Some designs enhance execution speed; others place minimal demands on system memory; still others encourage rapid program design and coding. Some languages include constructs that simplify types of applications (such as those that employ interrupt-driven coprocesses) that may be difficult or impossible to write in other high-level languages.

Several language design features can be expected to lower software costs. These include the following:

Ease with which the language can be learned. Easier-to-learn languages should attract more programmers. There should be a smaller education or training cost to be amortized over the programmer's career with the language.

Encouragement of correct programming. Certain language features have a strong bearing on whether a program will work as intended. For example, those languages permitting a variable normally used to hold integer values to be casually assigned a character value instead make it easy for bugs to creep into programs.

Transportability. Face it, even the IBM pc will eventually seem obsolete to us all. Will our software investment also be obsolete? Not if it can be readily transported to the

---

Dr. Allen Munro is assistant director of Behavioral Technology Laboratories at the University of Southern California.

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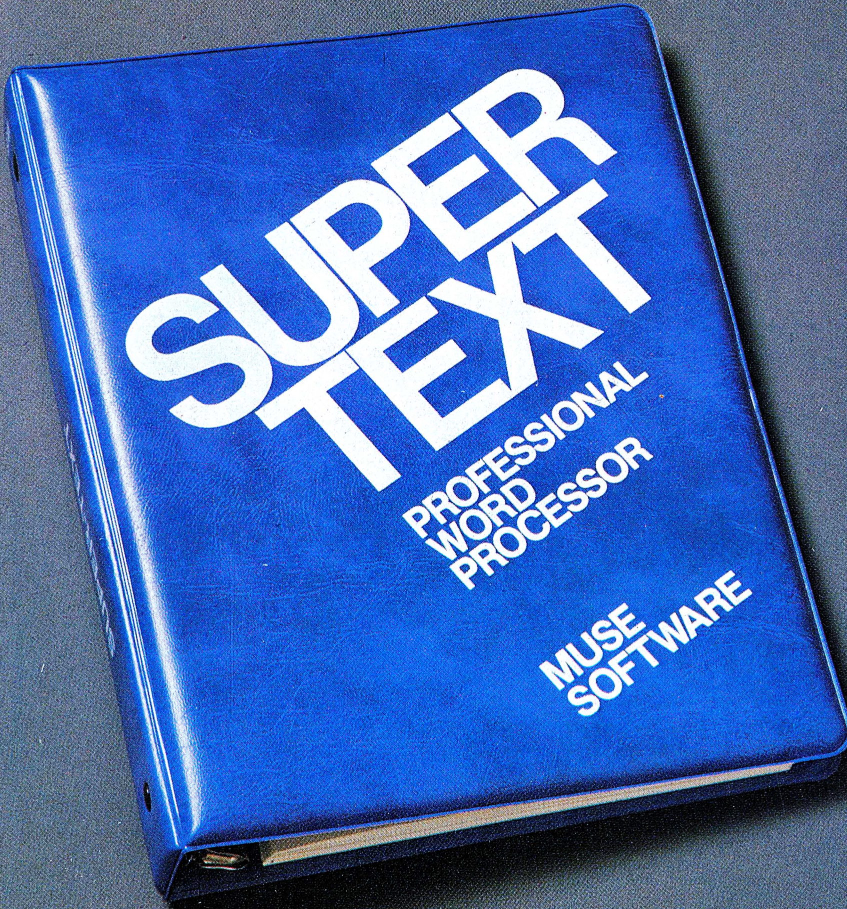

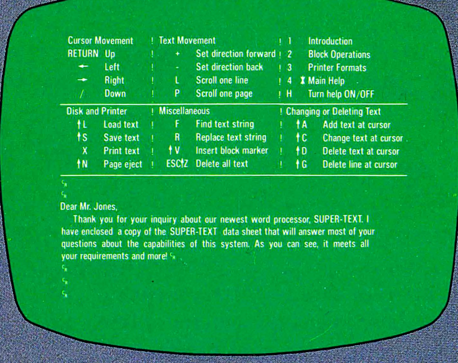

```
Cursor Movement    ! Text Movement                 ! 1    Introduction
RETURN  Up         !    +   Set direction forward  ! 2    Block Operations
  ←     Left       !    -   Set direction back     ! 3    Printer Formats
  →     Right      !    L   Scroll one line        ! 4  ⧗ Main Help
  /     Down       !    P   Scroll one page        ! H    Turn help ON/OFF
--------------------------------------------------------------------------------
Disk and Printer   ! Miscellaneous                 ! Changing or Deleting Text
  ↑L    Load text  !    F   Find text string       !   ↑A   Add text at cursor
  ↑S    Save text  !    R   Replace text string    !   ↑C   Change text at cursor
   X    Print text !   ↑V   Insert block marker    !   ↑D   Delete text at cursor
  ↑N    Page eject !  ESC↑Z Delete all text        !   ↑G   Delete line at cursor
--------------------------------------------------------------------------------
␍
␍
Dear Mr. Jones,
   Thank you for your inquiry about our newest word processor, SUPER-TEXT. I
have enclosed  a copy of the SUPER-TEXT  data sheet that will answer most of your
questions about the capabilities of this system. As you can see, it meets all
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␍
␍
␍
```

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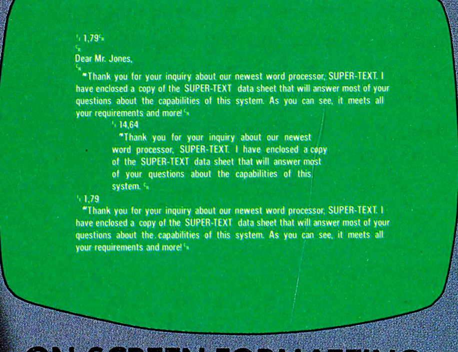

```
1,79␍
␍
Dear Mr. Jones,
␍
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          14,64
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          of your questions about the capabilities of this
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next generation of computers.

There are degrees of transportability. Programs written in assembly language typically are not at all transportable. Basic programs can be transported, but only with a significant amount of rewriting, since each computer's Basic differs from every other computer's. Fortran-77 is transportable at the source level; that is, the text version of a program must be recompiled to run on a new computer. UCSD Pascal programs are (ideally, anyway) compatible at the compiled-code level.

Power. A powerful language is one that provides the tools to let the programmer implement a design in a straightforward manner. In some ways the Pascal language, for example, lacks sufficient power. It is possible in Pascal to refer to a specific memory address, but the technique for doing that is elaborate and difficult to understand. A language without sufficient power will either be ignored by the programming community or will be so thoroughly modified in each implementation that it will be represented by a different and incompatible dialect on every machine.

Maintainability. Applications written in some languages are much more easily maintained than programs written in others. To get a feel for the maintainability of programs in a given language, one must ask the question, "How difficult is it likely to be for a programmer who isn't the original author of a moderately large program written in this language to add a new feature to the program?" There are several components to maintainability. One of these is readability. Programs written in Forth or assembly language tend to be less readable than programs written in Pascal.

Modularity. Closely related to maintainability is modularity, or modular organization. Modular programs are those written in discrete chunks, such that the chunks can communicate with each other only in very restricted ways. Because interactions among modules are very strictly controlled, modifications made to one module tend not to generate unexpected bugs in other portions of the program.

Keeping It Simple. An ongoing debate in the design of programming languages centers on the issue of complexity. Language designers must weigh the virtues of simplicity—which promotes rapid learning, program readability, and correctness—against the advantages gained from complex features useful to expert programmers.

Basic is an example of a language that, at least in its original conception, was designed to be simple. That it failed to remain simple as machine-specific dialects evolved was the consequence of its failure to provide many essential features, such as disk I/O. PL/1, on the other hand, is an example of a language that was designed to provide many features, at the price of being complex. Its complexity has had consequences for the employment of system resources, for learning the language, and for the correctness of programs written in the language.

Pascal is an example of a simple structured language. Niklaus Wirth designed it as a teaching language. The advantage of simplicity in Pascal is not, however, just that it can be learned fairly easily. Its clear, comprehensible structure promotes a programming style that reflects the logic of a program's design. This simplicity increases the readability and modifiability of programs written in Pascal.

Pascal is a member of a class of "structured" languages that include Algol, which was developed before Pascal, and Modula-2 and Ada, the successors to Pascal. The goals of structured languages such as Pascal are (1) to help programmers write correct code and (2) to encourage the writing of maintainable programs.

Maintainable programs can be modified by someone other than the original programmer. Maintainability is a very important goal for major programming projects. Military and industrial studies have shown that software maintenance may account for 70 to 90 percent of the total software costs for such projects. Controlling this expenditure has become a matter of vital concern to software industry managers.

Programmers have their own reasons for being interested in the issue of software maintenance. It's a lot more interesting to design and write new programs than to spend 70 to 90 percent of one's time trying to figure out how to modify someone else's code. Pascal-related languages are therefore of interest to anyone who writes substantial programs that are expected to remain in use for some time. The question is, which language is best?

Wirth developed Pascal in response to another programming language, Algol-68, which was designed over a period of several years by an international committee of computer scientists. Perhaps because the language was committee-designed, it became unwieldy, as almost all the features desired by all the experts were added to the language. Wirth rejected the notion of a language built to the specifications of a committee, and produced, in 1968, a much simpler and more elegant programming language, Pascal.

The verdict of history, in this instance, supports the efforts of the individaul language designer over those of the committee. Today Pascal is the most widely used computer language for teaching programming in American universities. In addition, it has enjoyed widespread success on personal computers, with many thousands of personal computer users employing UCSD Pascal, as well as other Pascal implementations, such as IBM Pascal. There is no demand for Algol-68 compilers for personal computers.

Managers and programmers committed to the discipline of structured programming are now asking whether history is about to repeat itself. The Department of Defense has a very expensive software maintenance problem. Maintaining a software product may account for up to 80 percent of its lifecycle costs. The Defense Advanced Research Projects Agency financed the design of a new language to resolve the problem.

A large, complex, feature-laden programming language, Ada, was the final product of a series of defense contracts in the late 1970s. As of this writing, there is no fully validated Ada compiler available on any computer, although several have been in development for very large supermini computers and IBM mainframes for some time, and a few have finally been submitted for validation. Implementability was one of the design requirements of Ada, but the compiler-generation process is calling into question how well this requirement was met.

Ada—The First Programmer. Ada is named for Lady Augusta Ada Lovelace, the daughter of Lord Byron and the world's first computer programmer. She wrote programs for Charles Babbage's Analytical Engine, a mechanical computer that was never completed because the machining technology of the day could not provide the fine tolerances called for in its design. The Analytical Engine failed despite years of grant support from the British government, and Ada's critics see a parallel in the future of the language named after its programmer.

Hundreds of computer scientists and sophisticated computer users contributed to the many design phases of Ada. The result is that it provides a very large number of features, including some that work against the principle of simplicity. The parallels between Ada and Algol-68 are striking.

Is there a candidate for the role of a simple competitor to Ada? Can any programming language play the role of an alternative to Ada, as Pascal did to Algol-68?

The answer, of course, is yes. Wirth, apparently unhappy once again with the product of a language-design committee, has produced a new language named Modula-2. Modula-2 combines what Wirth considered the best features of Pascal with those of another language he designed, Modula.

Modula-2 is the design of a single computer scientist driven by a consistent vision that places a very high value on simplicity. As a result, the core of Modula-2 is quite small; Wirth defined it in a booklet of only

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forty-eight pages. Not every desirable feature is present in the language itself. Instead, utility features can be added in modules, program blocks similar in some ways to UCSD Pascal Units.

Ada, in contrast, offers a very wide range of features, many of which are quite sophisticated but may be employed only rarely. Charles Moore, the inventor of Forth, says Ada has "tried to be all things to all people. It's much too complex a language—especially for the less experienced programmer."[1]

Ada and Modula-2 have a number of similarities. Both took Pascal as a starting point for development, although Ada has more extensive departures from that standard than does Modula-2. The experienced Pascal programmer will be able to easily follow most of the source text of programs written in either language. Both languages sought to remedy a number of the same flaws in Pascal's design. Enhancements provide for concurrent processing and more direct programmer access to the machine. An important set of changes enforces a more modular approach to programming than does Standard Pascal.

Modular programming encourages the independent development and testing of conceptually separate portions of a program. This modularity permits the different functions of a major programming project to be assigned to different programmers, who can develop program portions independently, once the software interfaces among the separate parts have been specified.

Modular programming is an important prerequisite for the emergence of a discipline of software engineering. From a software engineering viewpoint, a program should not be the product of a single mad-dog genius programmer, developing a system that is in no way compatible with the work of other programmers. Instead, programs are built up out of a set of software components produced by professional software engineers. The discipline of structured programming should even make it possible for the authors of these different modules to be anonymous to each other.

Beyond UCSD Pascal. Modula-2, however, goes several steps beyond UCSD Pascal Units. Modula-2's modules have two parts, a *definition* and an *implementation*, and these two parts are compiled separately. A module is used by other modules and programs, which are its clients. All communication between a module implementation and a client is specified in the module definition.

Tom DeMarco, a structured systems development expert with Yourdon, Inc., argues that "if you go back and compare Modula-2 to the statement of objectives published for Ada, you're likely to conclude, as I do, that Modula-2 satisfies most of them as well as Ada, but with far less obfuscation."[2] A comparison of the design goals of Modula-2 and Ada may convince software developers that Modula-2 deserves serious consideration.

Volition Systems, a software house based in Del Mar, California, has made hands-on Modula-2 experience possible for owners of the Apple II and III, the Sage, and now the IBM Personal Computer. The Volition Modula-2 system is more than just a Modula-2 compiler. It is a complete software development system. The package is built on a version of the UCSD Pascal Operating System, which is included.

The UCSD Pascal Operating System is based on the concept of the p-machine, a mythical computer with optimal characteristics for Pascal program execution. P-System compilers, be they on Apples, DECs, Sages, or IBM pcs, all compile Pascal text files (the readable source) into machine instructions for the p-machine. At execution time, a special p-System interpreter interprets the p-machine instructions to run on the real computer. Since the p-machine instructions, called p-code, are closer to real machine language than are the commands of a higher-level interpreted language like Basic, p-code programs usually run a lot faster than Basic programs.

The Volition p-code interpreter is based on the UCSD Pascal II.0 version rather than the IV.x version from Softech Microsystems. Is this an advantage or disadvantage? The most important advance of version IV over version II was the implementation of a method of coprocessing in IV. (Don't ask about version III.) Unfortunately for Softech p-System users, the speed of IV is typically a great deal less than that of version II. Does this mean there is no concurrency in Volition's UCSD Pascal System? No, indeed; coprocessing can be implemented in a library module. One of the Volition-supplied library modules, called Processes, implements a model of sequential processes.

Two versions of the p-code interpreter are provided. One runs on 64K pcs, the other on systems with at least 128K. An included configuration program lets you choose the interpreter to fit your machine. A file manager is included for managing disk files and volumes. In addition, the Volition Systems Advanced System Editor (ASE) is part of the package.

ASE is attracting a dedicated following among p-System users; an ASE special-in-

---

[1] "DOD Wants a Twenty-five-Year Lifespan for Its New Languages," *Infoworld*, vol. 4, no. 41, October 18, 1982, p. 27.

[2] DeMarco, T., "Modula-2: Why It Matters," *The Yourdon Report*, vol. 6, no. 2, March-April 1981, pp. 1-2.

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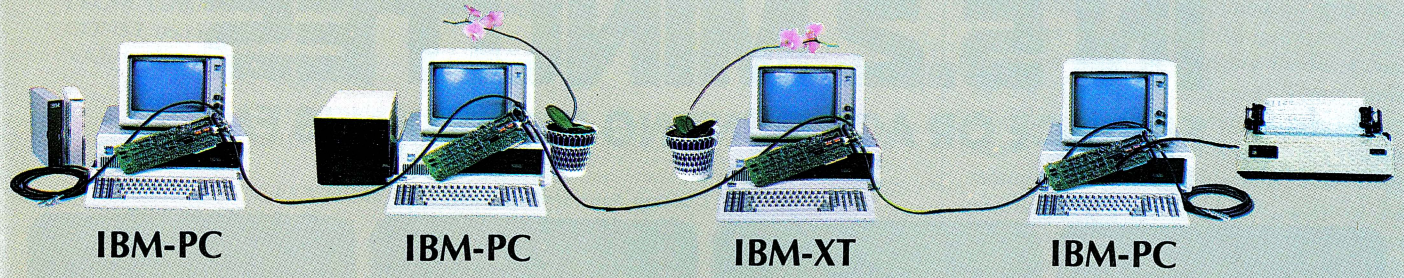

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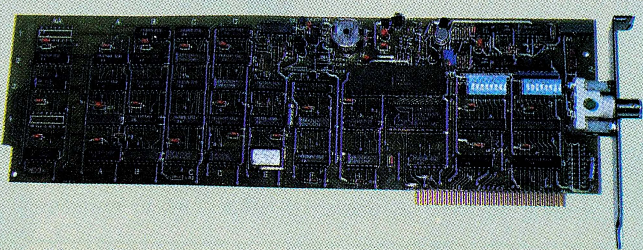

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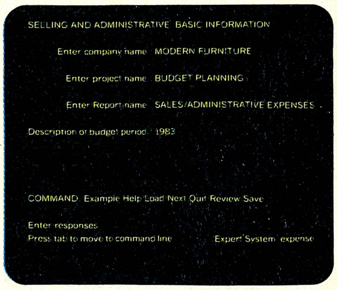


```
SELLING AND ADMINISTRATIVE  BASIC INFORMATION

        Enter company name  MODERN FURNITURE

          Enter project name  BUDGET PLANNING

          Enter Report name  SALES/ADMINISTRATIVE EXPENSES

Description of budget period  1983

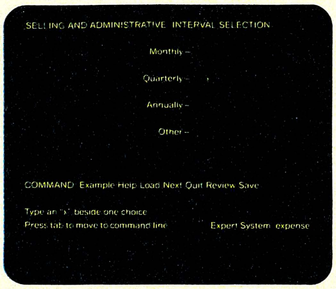


COMMAND  Example Help Load Next Quit Review Save

Enter responses
Press tab to move to command line          Expert System  expense
```

Gentlemen, start your computers.

Time: 0



```
SELLING AND ADMINISTRATIVE  INTERVAL SELECTION

                         Monthly –

                        Quarterly –

                         Annually –

                           Other –

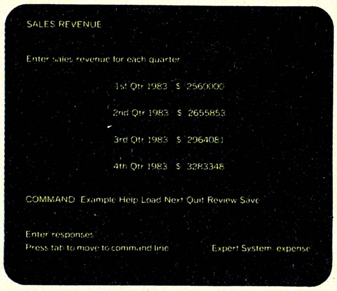


COMMAND  Example Help Load Next Quit Review Save

Type an "x" beside one choice
Press tab to move to command line          Expert System  expense
```

Select budget intervals.

Time: 0.5



```
SALES REVENUE


Enter sales revenue for each quarter

                1st Qtr 1983   $  2560000

               2nd Qtr 1983   $  2655853

               3rd Qtr 1983   $  2964081

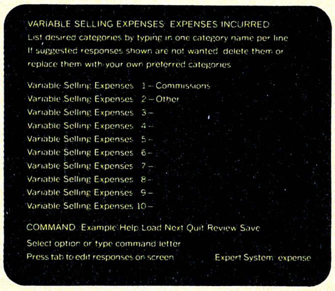
               4th Qtr 1983   $  3283348

COMMAND  Example Help Load Next Quit Review Save


Enter responses
Press tab to move to command line          Expert System  expense
```

Enter sales revenue.

Time: 1.0



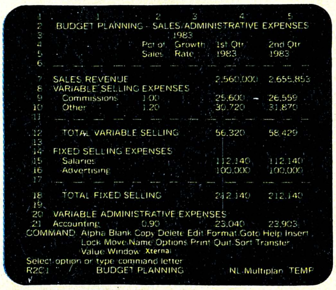
```
VARIABLE SELLING EXPENSES  EXPENSES INCURRED
List desired categories by typing in one category name per line
If suggested responses shown are not wanted  delete them or
replace them with your own preferred categories

Variable Selling Expenses   1 – Commissions
Variable Selling Expenses   2 – Other
Variable Selling Expenses   3 –
Variable Selling Expenses   4 –
Variable Selling Expenses   5 –
Variable Selling Expenses   6 –
Variable Selling Expenses   7 –
Variable Selling Expenses   8 –
Variable Selling Expenses   9 –
Variable Selling Expenses  10 –

COMMAND  Example Help Load Next Quit Review Save
Select option or type command letter
Press tab to edit responses on screen          Expert System  expense
```

Enter selling expenses.

Time: 1.5



```
 1           1              2        3          4           5
 2   BUDGET PLANNING - SALES/ADMINISTRATIVE EXPENSES
 3                           1983
 4                        Pct of   Growth   1st Qtr      2nd Qtr
 5                        Sales    Rate     1983         1983
 6  ___________________________________________________________
 7  SALES REVENUE                            2,560,000   2,655,853
 8  VARIABLE SELLING EXPENSES
 9    Commissions         1.00               25,600  -   26,559
10    Other               1.20               30,720      31,870
11  ___________________________________________________________
12    TOTAL VARIABLE SELLING                 56,320      58,429
13
14  FIXED SELLING EXPENSES
15    Salaries                               112,140     112,140
16    Advertising                            100,000     100,000
17  ___________________________________________________________
18    TOTAL FIXED SELLING                    212,140     212,140
19
20  VARIABLE ADMINISTRATIVE EXPENSES
21  Accounting            0.90               23,040      23,903
COMMAND  Alpha Blank Copy Delete Edit Format Goto Help Insert
         Lock Move Name Options Print Quit Sort Transfer
         Value Window  Xternal
Select option or type command letter
R2C1              BUDGET PLANNING              NL Multiplan  TEMP
```

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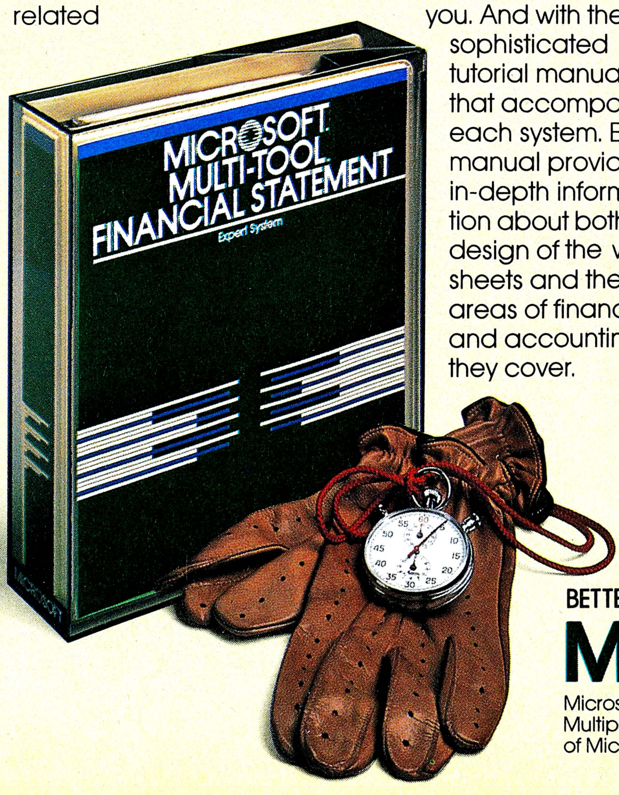

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```
MODULE HiHo;
    FROM SYSTEM IMPORT
        WORD, ADR, SIZE, PROCESS, NEWPROCESS, TRANSFER, IOTRANSFER;
    FROM Terminal IMPORT WriteString, WriteLn;
    CONST maxHiHo = 17;
    VAR i: CARDINAL;
          Hi, Ho, Main: PROCESS;
          A, B: ARRAY [1..200] OF WORD;
    PROCEDURE WriteHi;
    BEGIN
        LOOP IOTRANSFER(Hi,Ho, 1); (*wait on interrupt vector 1 *)
            WriteString('hi');
        END;
    END WriteHi;
    PROCEDURE WriteHo;
    BEGIN
        LOOP WriteString('ho');
            INC(i);
            IF i > maxHiHo THEN
                WriteLn; i := 0;
            END;
        END;
    END WriteHo;
BEGIN i := 0;
    NEWPROCESS (WriteHi, ADR(A), SIZE(A), Hi);
    NEWPROCESS(WriteHo, ADR(B), SIZE(B), Ho);
    TRANSFER(Main, Hi);
END HiHo.
```

Listing 1. © 1983 Volition Systems; used by permission. This listing and forty-seven others are provided as tutorial material on a separate disk included in the Modula-2 distribution.

Hi, Ho, and Main are declared as Coroutines—PROCESSes in the terminology of Modula-2. Coroutines are procedures that execute independently. The two calls of NEWPROCESS in the main body of the above module create two Coroutines, one to execute WriteHi in memory area A and the other to do the procedure WriteHo in area B. An interrupt through interrupt vector 1 causes an implicit transfer from Process Ho to Process Hi.

terest group was formed at the recent USUS (UCSD p-System User's Society) convention in San Diego. ASE is a screen-oriented editor that can edit files as large as the available disk space, thereby avoiding the limitation of available memory that constrains the standard p-System editor. It offers many powerful features, including user-defined editing macros.

A Unix-like command shell, called p-Nix, and its utilities allow the use of Unix commands, such as *ls>discdirec*, which writes the directory of the prefixed disk to the file Discdirec. Shell commands can be linked together so that the output of one serves as the input to another. This is the Unix piping facility.

In addition to a library of standard system and utility modules, there is a librarian manager program for maintaining the Modula library. A serial communications program is provided to permit the downloading of files from other machines to the pc. It may be worth noting that, since Apple Pascal is a dialect of version II, many p-code files from the Apple can be expected to work on the IBM pc running the Volition Systems version of UCSD Pascal.

The Volition Systems release disk includes a limited Pascal compiler as well as the Modula-2 compiler. Finally, there are several short Modula-2 example programs. Winddemo, for example, shows how a Modula-2 program can set up and write to four different windows on the screen "at the same time."

The Volition Systems Modula-2 compiler provides two additions to the standard Modula-2 language. These are *forward* declarations, which permit a procedure to be referenced before it's defined in a source file, and *packed* data representations, for more economical use of storage space. Both of these features are familiar to UCSD p-System developers. Other features, including many based on the UCSD Pascal operating system, are available not as language extensions but rather as Modules.

Modula-2 over Ada. The staff of Volition first became interested in Modula-2 in the course of a project to develop an Ada system for an industrial client. The original plan of the Volition Systems staff was to write an Ada kernel (the operating system support level) in Ada. They were shocked to find that it could not be done. An investigation into Modula-2 quickly convinced them that Wirth's new language provided adequate power for the implementation of an Ada kernel.

The Modula-2 language is actually smaller—that is, it has fewer reserved words—than UCSD Pascal. Many essential capabilities are not included directly in the language but are instead provided in the standard library and utility modules found in the file Modula.Library. These library modules provide random-access file routines, standard read-and-write routines, storage allocation (with new and dispose procedures), a math library, console handling, subprogram calling, and a process scheduler. These are the standard utility modules called for by Wirth's specification of Modula-2. In addition, Volition Systems provides utility modules that give the programmer access to features such as string functions and procedures and decimal arithmetic. Pascal programs can be called from Modula-2, and facilities are provided for interrupt-driven processes, permitting real-time control in Modula-2 programs.

The major advantage of Modula-2 over UCSD Pascal is the enforcement of a structured development discipline. During the development of a major software product, programmers working on different interacting modules need only agree on their interfaces, not on the internal structure of the modules. Once a definition is established and compiled, any changes in the internal structure of the implementation part of the module or in the internal structure of the client can be assured of not interfering with each other. On the other hand, whenever the definition portion of a module is changed and recompiled, Modula-2 requires the recompilation of those clients that use the module as well as the recompilation of the module's implementation. The interface policing ensures proper communication among modules.

Every module is given a "module key" at the time of compilation. The system checks at run time for a module key mismatch between an interface and an implementation or client. Programs cannot run until all necessary parts are recompiled. This enforcement policy permits the improved software methodology characteristic of structured programming by protecting users from abusing the modular approach.

Because the language core is small, defining a standard version is a straightforward matter. Enhancements are provided in the module framework. The techniques used for I/O, process scheduling, and storage allocation for a particular Modula-2 implementation are not part of the language but rather are provided in the standard library modules. This means that the user has the option of replacing the utilities provided with others of his or her invention. Furthermore, these features, because they're provided by modules, need be present in sys-

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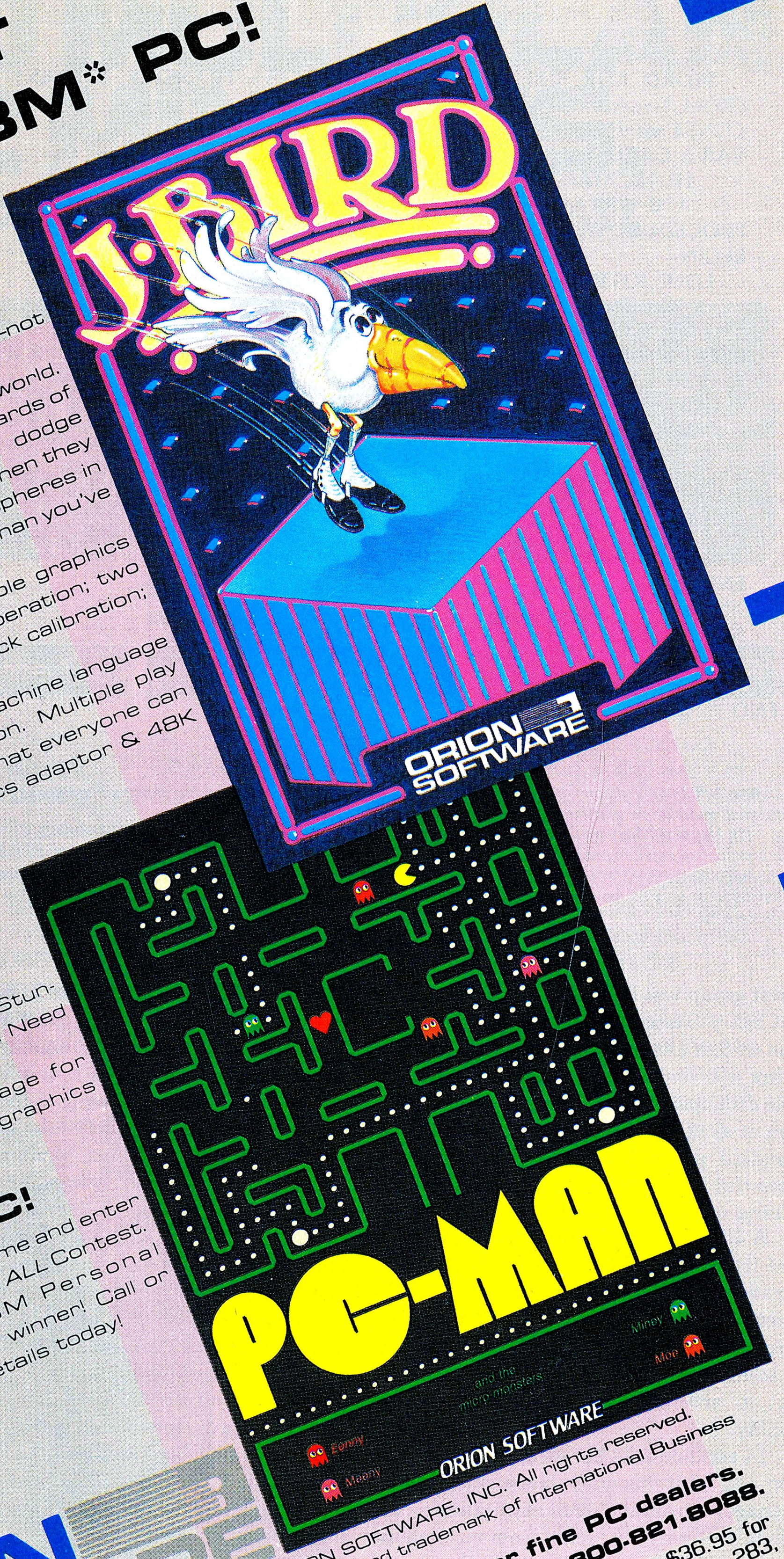

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tem memory only when they are required by an applications program; this approach conserves system resources.

Modula-2 permits low-level machine access by providing pointer arithmetic and fixed-address variables, thus obviating the need for the tricky variant records required to access machine addresses in Pascal. Furthermore, Modula-2 provides for explicit type conversion, thereby giving the programmer better access to the machine than does Pascal, while making the programmer's intent clearer than do most Pascal methods for type conversion.

Dynamic array parameters are possible in Modula-2. Pascal programmers will rejoice at the freedom of not having to set array bounds for formal parameters at the time a subprogram is written.

Fewer *begin-end* pairs are required in Modula-2 than in Pascal, because Modula-2's *while, with, for,* and *if* constructs are all terminated with *end.*

There are other minor but welcome improvements to Pascal in Modula-2. Constant expressions are permitted so that the programmer can make constant declarations—such as

CONST HALFMAX = MAX DIV 2

Declaration order restrictions are relaxed, which makes it possible to group constant, type, variable, and procedure declarations in a natural way. Identifiers are significant to any length and thus don't have to differ from each other in the first eight characters as they do in Pascal. Flow of control is improved through the inclusion of features such as *loop-exit.* The *case* statement has been improved, first by permitting subranges as well as constants as case selectors, and second by providing an explicit *else* condition as an option. Logical expressions are evaluated from left to right, and the evaluation is short-circuited, thus sparing the programmer the need for many nested *if* clauses to prevent evaluation of terms that produce value range errors.

Pros and Cons. The many benefits of Modula-2 are partially offset by some disadvantages. The simplicity of Modula-2's syntax imposes some extra burdens on the programmer. One example is the lack of generic I/O procedures. In Pascal, the program can use the single procedure *write* to output integers, real numbers, characters, and (in UCSD Pascal) strings. In Modula-2, variables of each type must be output with a procedure that takes parameters of that type. This means more lines of source code for the programmer to write, but the compiled code is no less compact or efficient than that produced by a Pascal compiler. The Modula-2 programmer must do some of the work that is handled by the compiler in Pascal.

Many programmers may find that Modula-2's case-sensitivity is an annoyance. Upper and lower case are significant in Modula-2; the variable MyVar has a different referent from the variable MYVAR, and both are different from Myvar. It's easy to forget what you've capitalized. Fortunately for users plagued with poor memories, the Volition Systems implementation provides a compiler option to turn off case-sensitivity.

Real number operations in the IBM pc implementation of Modula-2 are either ideal or impossible, depending on the resources and requirements of the user. Volition has chosen to support floating-point operations on the Intel 8087 math coprocessor chip. This is wonderful for those who already have the chip. Volition supplies one of the few software development packages that automatically support it. On the other hand, if you don't have the chip, you can't use reals. There is no software support for real number operations on the pc's 8088. This is a disadvantage for users who require only a few non-time-critical real number computations and who don't want to shell out the extra two hundred dollars-plus for the 8087.

More detailed information on programming in Modula-2 can be found in a new book by Wirth, *Programming in Modula-2*[3]. IBM pc owners who believe in hands-on learning can try out the Volition Systems implementation of Modula-2. The computer system must include at least 64K of RAM and be equipped with two floppy disk drives.

The Modula-2 package includes, in addition to the operating system and software tool kit described above, a copy of Wirth's book, a well-written Modula-2 users' manual, and a guide to the Volition Systems implementation of the UCSD Pascal operating system. The price for the complete package is $595.

Modula-2 is an advanced programming language. Its enforcement of structured program development makes it an appropriate vehicle for attacking major software projects. The process scheduling and direct machine access features suit it to system work. It also offers a number of small but significant syntax improvements over Standard and UCSD Pascal. Because the language is small and closely related to Pascal, it can be learned quickly by Pascal programmers. The combination of advantages to Modula-2 have been accomplished at the cost of some inconvenience to the programmer when write operations are required. However, it is a tribute to the compactness and elegance of this programming language that it can be used on a 64K personal computer. ▲

Modula-2. Volition Systems (Box 1236, Del Mar, CA 92014; 619-481-2286), $595.

---

3. Wirth, N., *Programming in Modula-2* (New York: Springer-Verlag, 1982). 176 pp.

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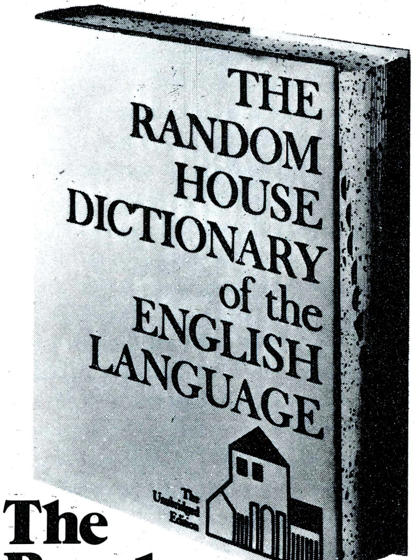

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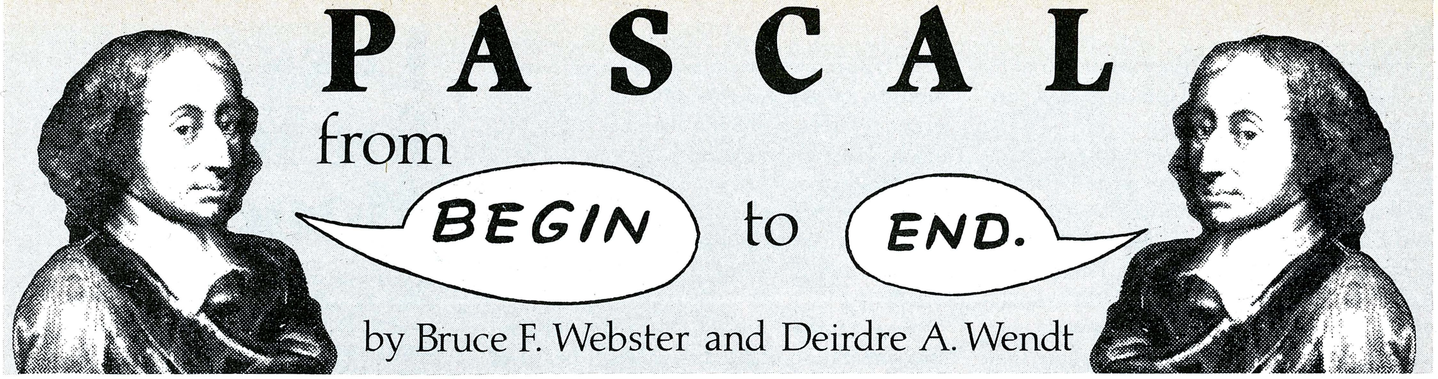

PASCAL from BEGIN to END.

by Bruce F. Webster and Deirdre A. Wendt

This column is a shorty—a carry-over from last month. Last month's installment was to have included a program showing usage of records, sets, and arrays, but we ran out of space and had to postpone the program. So here it is, with a short discussion of some of its features.

The listing shows the skeleton for a game of the *Star Trek* genre, similar to games found on almost all microcomputers. The game programmed here is incomplete; we leave its completion to you, as an exercise.

The skeleton provided here includes the global data definitions, a utility routine (*get _char*), a simple initialization routine (*initialize*), the basic program structure, and the main driving loop of the program. Most of the major procedures have been left as "dummies"; you can fill these in yourselves. This program, as written, will compile and run; it just won't do much.

Data Structures. Certain key values in the game are represented as global constants. These named constants are then used throughout the program in place of the actual values. By using constant names instead of values, we can make changes to the values in one place only, instead of having to go all through the program.

The program includes a number of user-defined data types and structures. *Charset* is defined primarily for use in the procedure *getchar*, while the enumerated data type *sides* is used in the data structure *ships*. The subranges *sectrange* and *quadrange* represent the sector and quadrant coordinate ranges, while *shiprange* gives the range of ID numbers for enemy ships.

The data structure *ships* is used to represent both enemy ships and the player's own vessel. The values *sx*, *sy*, *qx*, and *gy* represent the ship's current location. The ship's current energy and shield levels are saved in *energy* and *shields*. If the ship belongs to the player, then it has *beams* and *mines*. Enemy ships have only *missiles*, but they also have a cloaking device (*cloaked*) (which may be on or off).

The data structure *quadrant* defines each quadrant in the sector. It tells whether or not there is a starbase present (*starbase*) and, if one is present, where it is (*sbx* and *sby*). It also keeps track of the number of enemy ships in the quadrant (*numofships*) and which ones they are (*enemy*).

Only five global variables have been defined for the game: *sector* (the map), *theirships* (enemy ships), *ourship* (the player's ship), *cmd* (player's command), and *lowerset* (a set of lower-case letters). These variables are described in the listing itself.

The Program. As we said, the bulk of the program hasn't been written. We did write some of the initialization so that you could see how to access the various data structures. We also wrote the main body of the program, which simply prompts the user for a command and then calls the appropriate procedure. The rest of the program is up to you.

Contest. Now that you've got this much, we'd like to announce a contest. The challenge is this: Write a *Trek*-style game for the IBM pc in Pascal (UCSD or IBM) using the language features this column has discussed so far (control structures, subprograms, scalar data types, records, sets, and arrays). You may, if you wish, build on the program skeleton presented in this article. Entries will be judged on clarity of code, logical organization, and performance. Submit source and compiled code on floppy disk to:

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Next month we'll be looking at pointers and dynamic variable allocation. See you then.

```
PROGRAM  sampletrek;
(*
          sampletrek          a sample program demonstrating advanced
                              data structures—NOT A COMPLETE PROGRAM
          last update         06 May 1983
          language            UCSD Pascal version IV.0
          notes               uses "string" data type
*)
CONST
  sectlim                       =    8;  (* sector map is 8X8 quadrants         *)
  quadlim                       =    8;  (* each quadrant is also 8X8           *)
  shipmax                       =   40;  (* total # of enemy ships              *)
  enemax                        =    8;  (* max # of ships/quadrant             *)
  maxenergy                     = 1023;
  maxshields                    =  255;
  beammax                       =  255;
  minemax                       =   15;
  mislmax                       =   31;

TYPE

  charset                       = SET OF char;
  sides                         = (us,them);
  sectrange                     = 1..sectlim;
  quadrange                     = 1..quadlim;
  shiprange                     = 0..shipmax;

  ships =
    RECORD
      sx,sy                      : sectrange;      (* which quadrant?          *)
      qx,qy                      : quadrange;      (* where in quadrant?       *)
      energy                     : 0..maxenergy;   (* current fuel avail.      *)
      shields                    : 0..maxshields;  (* current shield level     *)
      CASE side : sides OF
        us    : (beams           : 0..beammax;     (* current beam strength    *)
                 mines           : 0..minemax);    (* # of mines left          *)
        them : (missiles         : 0..mislmax;     (* # of missiles left       *)
                 cloaked         : boolean)        (* cloaking device on?      *)
    END;

  quadrant =
    RECORD
      starbase                   : boolean;        (* is there a starbase?     *)
      sbx,sby                    : quadrange;      (* if so, where?            *)
      numofships                 : 0..enemax;      (* how many enemy ships?
      enemy                      : ARRAY[1..enemax] OF shiprange;
                                                   (* which ones are they?     *)
    END;
(*                               global variables                              *)
(*                                                                             *)
(*          sector          map of playing area—contains 64 quadrants          *)
(*                            each quadrant is also divided into 8X8 area      *)
(*          theirships      status of enemy ships (up to 40 of them)           *)
(*          ourship         status of our ship                                 *)
(*          cmd             user command for main loop                         *)
(*          lowerset        set of lower-case letters—used in getchar          *)
(*                                                                             *)
VAR
  sector                        : ARRAY[sectrange,sectrange] OF quadrant;
  theirships                    : ARRAY[shiprange] OF ships;
  ourship                       : ships;
  cmd                           : char;
  lowerset                      : charset;
```

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```
(*                        utility routines                                  *)

PROCEDURE get_char (VAR ch : char; msg : string; okset : charset);
(*
          purpose          writes msg and accepts command
          last update      03 May 83
*)
CONST
  ascoffset                   =    32;
BEGIN
  REPEAT
    write(msg); read(ch);
    IF ch IN lowerset
      THEN ch := chr(ord(ch) = ascoffset)
  UNTIL ch IN okset
END; (* of PROC get_char *)

FUNCTION rand(low,high : integer) : integer;
(*
          purpose          return random value from low to high (inclusive)
          last update      06 May 83
*)
BEGIN
  (* dummy function *)
END; (* of FUNC rand *)

(*                        MAIN PROCEDURES                                   *)

PROCEDURE initialize;
(*
          purpose          set everything up
          last update      06 May 83
*)
VAR
  x,y,indx,jndx,kndx,ecount       : integer;
  collided                        : boolean;

BEGIN
  lowerset := ['a'..'z'];

(*      initialize sector map—place starbases in 25% of them               *)
  FOR x := 1 TO sectlim DO
    FOR y := 1 TO sectlim DO
      WITH sector[x,y] DO BEGIN
        IF rand(1,4) = 1 THEN BEGIN
          starbase := true;       (* set starbase flag                      *)
          sbx := rand(1,quadlim); (* and place w/in quadrant                *)
          sby := rand(1,quadlim)
        END
        ELSE starbase := false;
        FOR indx := 1 TO enemax DO    (* zero out all enemy info           *)
          enemy[indx] := 0;
        numofships := 0
      END;

(*      initialize enemy ships—place in sector and quadrant                *)
  FOR indx := 1 TO shipmax DO
    WITH theirships[indx] DO BEGIN
      (* place no more than 8 (enemax) per quadrant *)
        REPEAT
          sx := rand(1,sectlim);
          sy := rand(1,sectlim);
        UNTIL sector[sx,sy].numofships < enemax;
        sector[sx,sy].numofships := sector[sx,sy].numofships + 1;
        ecount := sector[sx,sy].numofships;
        sector[sx,sy].enemy[ecount] := indx;

(*        make sure all ships in same quadrant have different locations      *)
      REPEAT
        qx := rand(1,quadlim);
        qy := rand(1,quadlim);
        collided := false;
        jndx := 1;
        WHILE NOT collided AND (jndx < ecount) DO BEGIN
          kndx := sector[sx,sy].enemy[jndx];
          IF (qx = theirships[kndx].qx) AND (qy = theirships[kndx].qy)
            THEN collided := true
            ELSE jndx := jndx + 1
        END
      UNTIL NOT collided;

      (* set all levels to maximum and mark ship as enemy                  *)
      energy := maxenergy;
      shields := 0;           (* shields turned off *)
    side := them;
    missiles := mislmax;
    cloaked := false;         (* cloaking turned off *)

  END;
  (*        initialize our lone ship                                        *)
  WITH ourship DO BEGIN
    sx := rand(1,sectlim);  sy := rand(1,sectlim);
    qx := rand(1,quadlim); sy := rand(1,quadlim);
    energy := maxenergy;
    shields := 0;             (* shields turned off *)
    side   := us;
    beams  := 0;              (* beams turned off *)
    mines  := minemax
  END;

END; (* of PROC initialize *)

(*              *** DUMMY VERSIONS OF MAIN PROCEDURES ***                    *)

PROCEDURE dowarp;
BEGIN
END; (* of PROC dowarp *)

PROCEDURE doimpulse;
BEGIN
END; ( of PROC doimpulse *)

PROCEDURE doshields;
BEGIN
END; (* of PROC doshields *)

PROCEDURE dobeams;
BEGIN
END; (* of PROC dobeams *)

PROCEDURE domines;
BEGIN
END; (* of PROC domines *)

PROCEDURE dodock;
BEGIN
END; (* of PROC dodock *)

PROCEDURE updatestatus;
BEGIN
END; (* of PROC updatestatus *)

PROCEDURE cleanup;
BEGIN
END; (* of PROC cleanup *)

(*                main body of PROGRAM sampletrek                            *)
BEGIN
  initialize;
  REPEAT
    update_status;
    getchar (cmd,'CMD > W)arp,I)mpulse,S)hields,B)eams,M)ines,D)ock,Q)uit:   ',
              ['W','I','S','B','M','Q']);
    CASE cmd OF
      'W'       : dowarp;
      'I'       : doimpulse;
      'S'       : doshields;
      'B'       : dobeams;
      'M'       : domines;
      'D'       : dodock
    END
  UNTIL (cmd = 'Q') OR (ourship.energy = 0);
  cleanup
END. (* of PROG sampletrek *)
```

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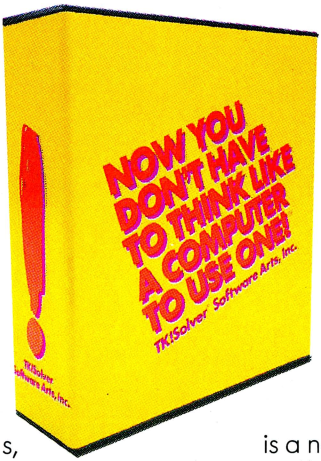
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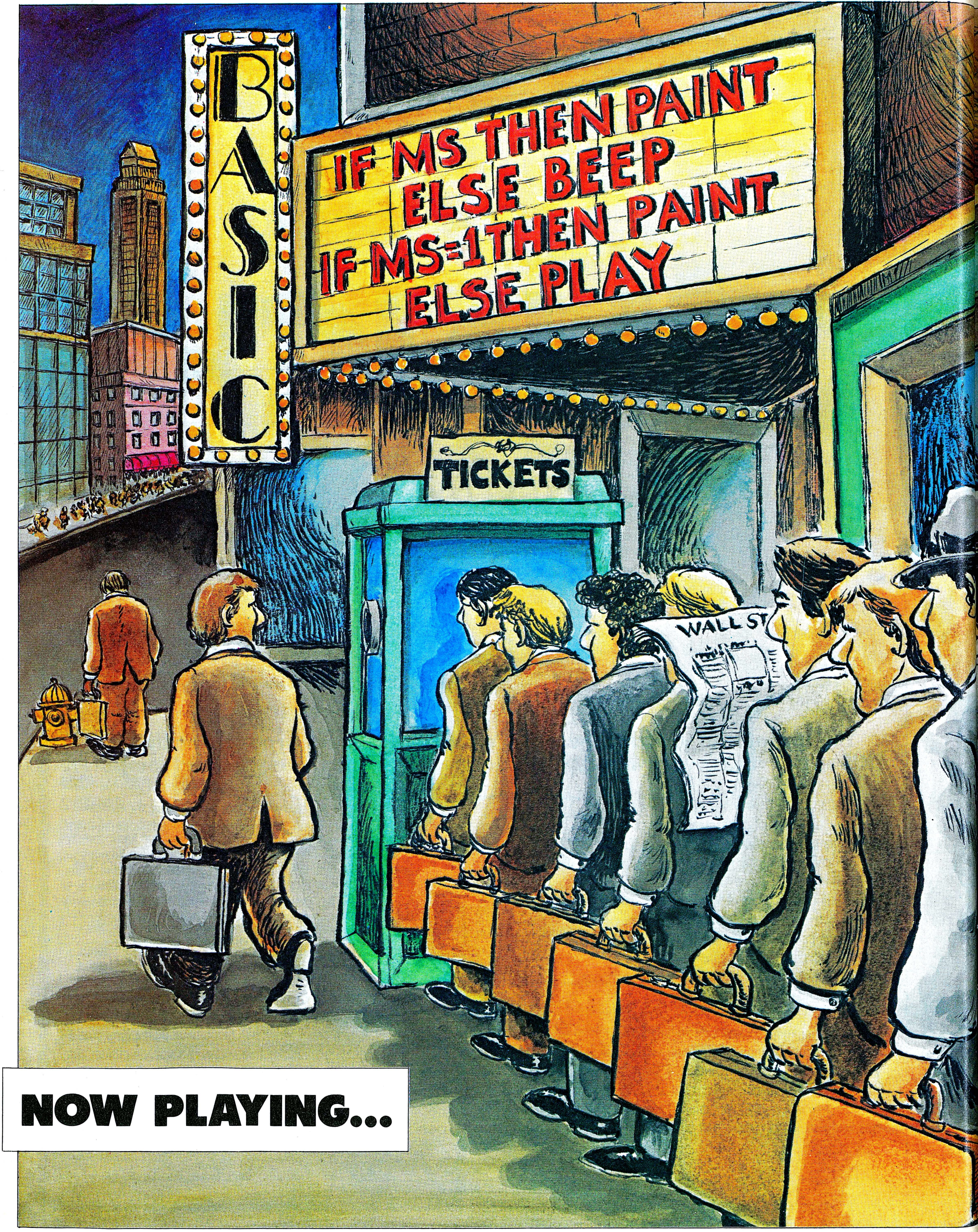
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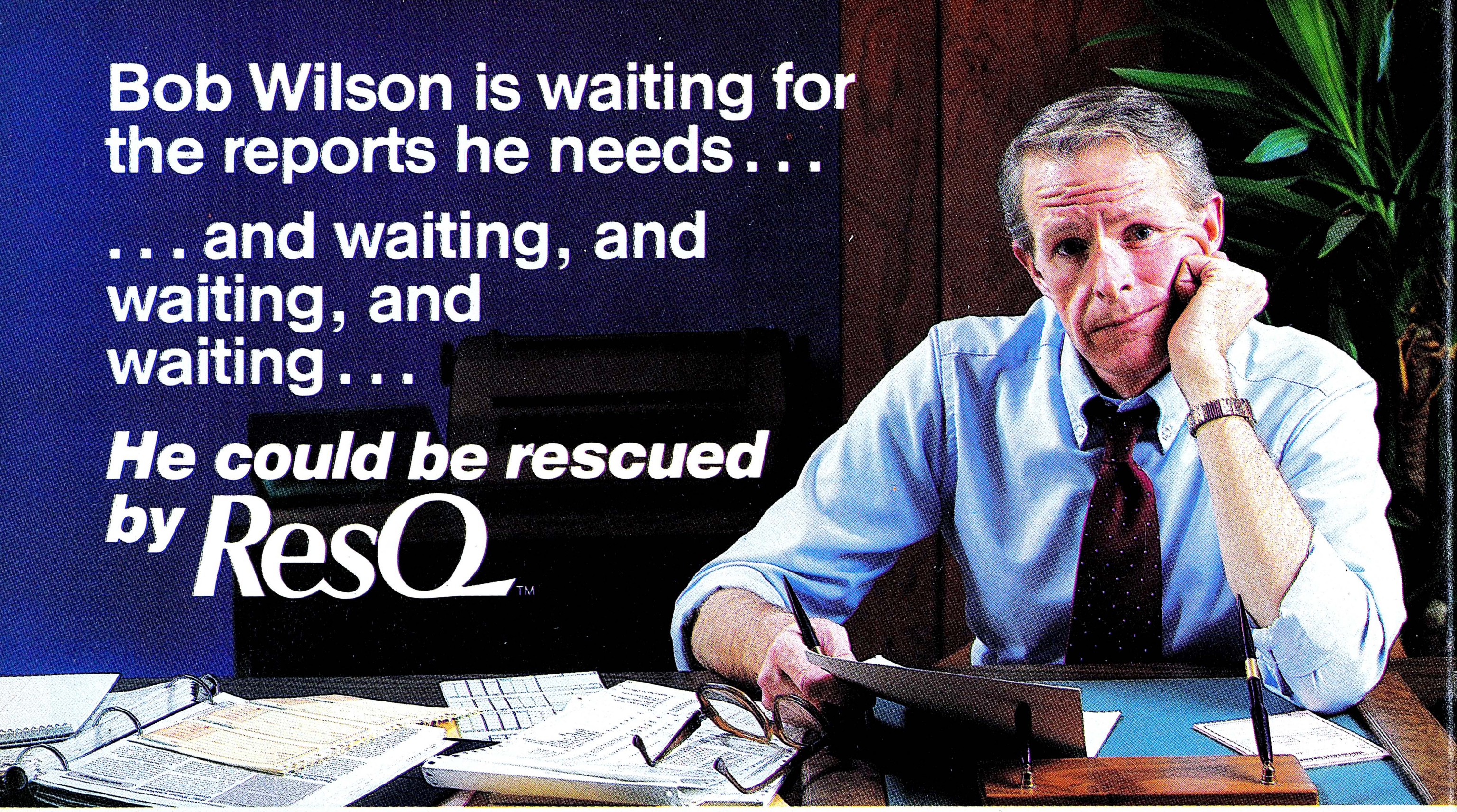
For many of us with IBM pcs, the pc is our first and only contact with the world of personal microcomputing. Even for those of us who have used other small computers—Apples, Radio Shacks, or whatever—the IBM Personal Computer is such a superior machine and has created such a large microenvironment of IBM-oriented hardware and software that many of us haven't yet realized how large a world is growing up around our pc.

There are three circles that have spread around our pc, three circles that define an ever-widening world that centers on the original version of the pc. The innermost is made up of the different versions of the pc that IBM makes. This inner circle embraces the pc and the XT; it also includes whatever new machines IBM might release, such as the long-rumored "Peanut," "Popcorn," and "Crackerjack" models—when and if they appear. The next larger circle is the circle of IBM-compatibles, the computers that are 100 percent able to use pc software and hardware, or at least try to be 100 percent compatible. This circle includes the Compaq and the other pc clones. And naturally, everything in the inner circle, the computers that IBM makes, is completely pc-compatible—so all the IBM pcs fit into the pc-compatible circle.

The last and largest of the three circles is the circle of the pc-like machines that use the DOS operating system. DOS, as we know it, was created by Microsoft specifically for the pc as the pc's main operating system. But since DOS was introduced, it has spread to quite a few other computers. After the pc was introduced, it quickly set a de facto industry standard for what a personal computer should be like. Since the pc appeared, quite a few of the new computers from other makers have been closely modeled on the most successful features of the pc. These "pc-like" computers all use the same microprocessor (the Intel 8088 or 8086) and have display screens and disk formats and other features that are generally similar to what the pc has.

The one thing that the pc-like computers have most in common, though, is the DOS operating system. Over sixty different computer makers have signed up with Microsoft to license and use DOS for their computers. This has created a large circle of computers that are pc-like and DOS-using—in short, there are coming to be very many computers that are close to the pc that we know and love. Each of these computers is different in its own peculiar way, but they all have some important things in common. They are all generally equivalent to our pc in capability, features, and the way they are used, because they are used with our familiar DOS.

by Peter Norton



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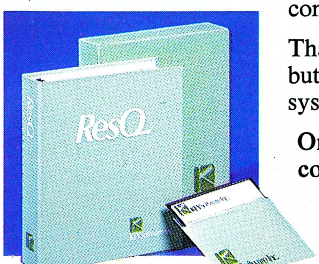

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To go back to the center of these three circles, we return to our pcs; but if we see beyond our pcs, we see much broader horizons than many pc users imagine. If we are shortsighted, we have fun using our pcs, we write programs for them, we buy programs and equipment for them, and we don't think much about the future. But if we widen our vision, then we start to think about some bigger issues—like what happens when our pcs become obsolete? Will we be able to transfer some of our equipment, our programs, and our skills? Or will we have to start from scratch? What if we use a pc in our work? Will we be able to share our files or our programs with people using other computers? With the rapid spread of personal computers, these aren't just minor issues—they start becoming very important, very fast.

This makes DOS a pivotal issue in our use of our computers, perhaps *the* pivotal issue. We get computers in order to run programs on them, and programs need a supporting environment, which is what an operating system, like DOS, provides. So DOS becomes the thing that a large number of computers and computer programs have in common.

We all use many programs on our pcs. If the programs that we write and buy for use on our pcs make use of the special strengths and features of the pc, then we become wedded to the peculiarities of the pc. On the other hand, if our programs forego using the special features of the pc and stay within the bounds of features that are common to all DOS computers, then we gain an enormous amount of flexibility in where we can go with these programs and what we can do with them. If we are buying a program, we are likely to be better off buying one that will work successfully on any DOS computer; that just increases the number of ways that we will be able to use these programs. And if we are creating programs, it is greatly to our advantage to write programs that are DOS-generic, and not tied to any one computer, so that we can sell to a wider market. Sixty computer makers, after all, will be creating an awful lot of DOS computers.

If we are to have programs that are DOS-generic, that will run on any DOS computer, then we need to have DOS-generic programming languages. Microsoft, the creator of DOS, has taken care of this need for us by producing seven different programming language translators; each of these seven will produce programs that will operate on our pcs and on the other DOS computers as well. If we produce programs using any of these seven translators, then our programs should have a much brighter future than if we write them solely for our pcs.

What are these seven DOS programming languages? They are Cobol, Fortran, Pascal, C, and no fewer than three different versions of Basic: a Basic interpreter, an ordinary Basic compiler, and a Business Basic compiler with special enhancements. Most of this list should look familiar to us, because five of the seven are nearly the same as the versions that IBM has been selling to us as pc programming languages. The two new items are C and the Business Basic. We'll save the Microsoft C compiler for a separate review on its own, for it is a very interesting and juicy topic. The Business Basic compiler we'll discuss here, but first we ought to take a deeper look at what these seven languages offer in general, and how they relate to what IBM has already given us.

The programming languages that IBM offers to us—interpretive Basic, the Basic compiler, Pascal, Fortran, and Cobol—are all produced by Microsoft, but with some custom work done to IBM's specifications. IBM had this done for two reasons: partly so that the languages would make use of the pc's particular features (this was done especially with the Basics), and partly so that IBM could put its own label and copyright on them. For the most part, though, the programming languages that IBM gave us were simply Microsoft's own languages, with minor adaptations for IBM. Now that the broader world of DOS computers is opening up, Microsoft has found the time ripe to release a set of generic DOS languages that will work with any DOS computer.

These generic Microsoft DOS languages are both more and less than what we are used to having from IBM. They are more because they have been developed further than they were for IBM. For one example, these languages support the 8087 arithmetic coprocessor; for another, Fortran and Pascal have been adapted so that they can talk to each other and share subroutines.

But also these Microsoft DOS languages are less than what we have from IBM because they can't include features that are unique to the pc. The only great disadvantage in creating programs and programming languages for the general DOS market is that such programs and languages have to work with the lowest common denominator. Only the features that will be on every DOS computer can be used in common DOS programs. This means that some of the nicest things about the pc are gone, like many of the graphics and sound commands in Basic. Similarly, each computer model has its own particular function keys, which means that generic-DOS programs can't rely on having ten function keys laid out in the pattern that we are used to for the pc; a program can count on having some sort of special function keys, but not exactly our pc's function keys.

All this raises some tricky issues for anyone developing programs for the pc. If we tailor our programs to the pc, then we get to use the wonderful special features of the pc—but our programs probably won't work well on other DOS computers; and we don't even know for sure how they will work with IBM's future machines. If we make our programs DOS-generic, then we must give up the nice capabilities of any one computer and work with the lowest common features. This isn't an easy decision. A lot of time, effort, and money can ride on the choice made.

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I would strongly argue, though, that we all tend to be shortsighted. The future of DOS-running computers is going to be very big. There are going to be lots of different computers, and likely even lots of different IBM computers. The more DOS-generic our programs are, both the programs we write and the programs we buy, the more comfortably we will move into the future of computing. This issue is like brushing your teeth; it's a nuisance now—but if we neglect it, the painful rot will set in later.

With the stage now set, let's look at the specifics of the Microsoft Business Basic compiler. The price is high, by the way. While the IBM Basic compiler sells for $300, the ordinary Microsoft Basic compiler lists for $400, and the Business Basic compiler has a list price of $600. At that price, Business Basic isn't for the casual user; it is intended for serious software developers.

Microsoft Business Basic comes to us in a form similar to that of the IBM Basic compiler. The compiler itself is a single program, and it compiles our Basic programs in a single pass. Just as it is with the IBM Basic compiler, Business Basic comes with two libraries and a runtime module. If our programs use some language features, such as *chaining* with *common*, then the runtime module is required to use the programs; otherwise, we can compile our programs either to use or not to use the runtime module. With the runtime module, our compiled programs take up much less space on disk; but we can't distribute the programs without the runtime module, and a licensing fee must be paid to Microsoft to distribute copies of the runtime module. If we want to avoid the runtime module, we give up some language features and our programs become bulkier, but they do not require any fee or permission from Microsoft to distribute and sell. (Incidentally, tests indicate that use of the runtime module slows programs down by about 30 percent; when speed matters, this can be an important difference.)

Also included with the compiler is the DOS Link program, which functions just like the Link that's included in IBM's PC-DOS, and a conversion program, called CBtoMB. CBtoMB translates programs from the peculiarities of CBasic into the peculiarities of Microsoft Basic. For users who have CBasic programs that they would like to convert for Microsoft DOS use, CBtoMB will do most of the work, and give warnings where there may be conversion problems.

The minimum machine requirements to use the Business Basic compiler are 64K and one disk drive, but, like most other languages, Business Basic works best with 128K and two disk drives.

The most interesting part about Business Basic is what extra features it adds to the Basic language and what it leaves out. Here is a summary of the extra features that make Business Basic special:

Business Basic provides a decimal single-precision floating point format; this solves one of the biggest problems in using Basic for accounting programs, which need more range than integers provide and which can't tolerate the rounding that is done in ordinary single-precision numbers. Decimal floating point for Business Basic provides fourteen decimal digits—which handles numbers up to one trillion dollars while not losing track of the exact pennies. That capacity should be big enough, but if it isn't and any rounding occurs, rounding will be done in decimal, not in binary. This long decimal format is the real heart of Business Basic, its main justification. All of the other features are just icing on the cake.

Arrays may have dynamic bounds. Dynamic arrays are a standard feature of interpretive Basic, but not of compiled Basic. Both the IBM and the standard Microsoft Basic compilers do not allow dynamic changes to the size of arrays; Business Basic does.

Functions can be more than one line so that they can include logic statements, looping, input, and so forth. In ordinary Basic, functions are little more than shorthand for algebraic formulas, even though most programming languages allow for functions that use the full power of programming logic. Business Basic gives functions the full use of the Basic language.

Input and output are enriched. This includes character input/output similar to what is provided in other—non-Microsoft—Basics and device-independent input and output.

Eight new string functions have been added. These features are what is new and extra in Business Basic. What is missing—from our point of view—is nothing peculiar to Business Basic. Business Basic includes all the features of the general Microsoft Basic but none of the special features of IBM Basic. All three Microsoft Basics—interpretive, ordinary compiled, and compiled Business Basic—are missing these IBM-specific features. So this is nothing peculiar to Business Basic. But from our point of view, as IBM users, all this is missing:

Graphics features, such as *draw*, *paint*, and *color*.

Sound features, such as *beep* and *play*.

All special use of the keyboard function keys and other IBM hardware features—such as the cassette, the light pen, and most screen-specific operations.

If you want to work within the very wonderful confines of the IBM pc, all the languages that IBM provides should suit your programming needs just fine. But if you want to address your programs to the larger and rapidly emerging world of DOS computers, now and in the future, then the Microsoft DOS-generic languages are for you. And for Basic programming, Microsoft Business Basic provides all the features of fast compiled Basic, with extensions that are very important for business programming. If you need the special capabilities of Business Basic, then it should be well worth its $600 list price.

Peter Norton is the author of the Norton Utilities *programs for the IBM pc, and the book* Inside the IBM/PC, *published by Robert J. Brady Co.* ▲

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COMING SOON...

MS-DOS 3.0

by Kevin Goldstein

Judging from Microsoft's plans for the next version of MS-DOS, the most popular

If you had a multitasking system, all

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Let's take an example. Suppose you wrote a Basic program that sorted a long list of names found in a disk file. That program is likely to be what is known as very I/O-intensive, or I/O-bound—that is, most of the time the program is waiting while information is being read from or written to the disk. With DOS 1.1 or 2.0, that waiting time is simply lost. But if you had a multitasking system, while your sort program was cranking away you could simultaneously receive a file coming in from the phone line via your modem, print that letter you wrote earlier, and still be able to use your word processor to write another letter. The amazing thing is, except for the clatter of the disks, the rat-

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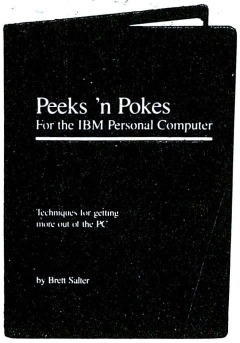
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COMING SOON...

MS-DOS 3.0

by Kevin Goldstein

Judging from Microsoft's plans for the next version of MS-DOS, the most popular of the pc operating systems should have no trouble holding on to its commanding lead.

The pc operating system is written for IBM by Microsoft Corporation. As sold by Microsoft, the DOS is called MS-DOS; IBM made some relatively minor changes to MS-DOS and released it as PC-DOS. So while IBM is absolutely mum on what future versions of its DOS will look like, a pretty good idea of what's in store from Big Blue can be garnered by keeping a sharp eye on Microsoft's plans.

And exciting plans they are: The next versions of DOS will bring multitasking capabilities to the pc. That means, first of all, the ability to run more than one program at a time. As an example, suppose you were typing a letter in *Wordstar* and realized you needed to calculate some information in a spreadsheet program to include in your letter. With DOS 2.0, you would have to close the *Wordstar* document you were editing, exit to DOS, then load the spreadsheet and do your calculations. That done, you would return to DOS, reload *Wordstar*, open your letter file, find the place in the file where you left off, and go from there. Each time you needed to use the spreadsheet, you would have to go through this tedious process.

If you had a multitasking system, all you'd need to do is suspend the *Wordstar* program, load your spreadsheet (which won't wipe out *Wordstar* or your still-open letter file), do the calculations, then switch back to *Wordstar* and insert them. You could switch back and forth between *Wordstar* and the spreadsheet as often as necessary. And if you wanted to make a phone call to verify some information in your letter, you could just as easily move to a phone directory program without shutting down either *Wordstar* or the spreadsheet. That's what you can do with multitasking.

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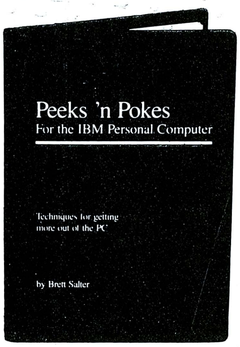
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tling of the printer, and the blinking of the modem lights, you wouldn't even know that your pc was doing anything other than running your word processor. The number of different processes you could have going simultaneously before performance became visibly affected depends on how compute-bound each process is—that is, how much microprocessor time each program requires; compute-bound is more or less the opposite of I/O-bound. All of the processes in the preceding scenario are very I/O-bound, so you could have a goodly number of them active at once.

Multitasking is a feature that has been available for some time in the mainframe and minicomputer world, as well as the high-end microcomputer arena. As a matter of fact, one of the leading suppliers of multitasking operating systems for the higher-performance machines is (look surprised) Microsoft. Microsoft sells an operating system known as Xenix, which is a version of yet another operating system known as Unix. Unix is exceedingly popular in the minicomputer market, where it is highly valued for both its power and versatility, especially when it's used for program development. Some time ago, Microsoft committed itself to the goal of evolving MS-DOS toward Unix (and thus Xenix) compatibility. Multitasking is one of the hallmarks of Unix, so the company's plans to add this powerful feature to MS-DOS should come as no surprise.

What might come as a surprise, however, are some of the additional advantages of Xenix compatibility. According to Mark Ursino, Microsoft's marketing manager for Xenix, it should be fairly easy to move high-level language programs from Xenix machines to DOS 3.0 machines; with more than fifty thousand Xenix users and untold numbers of Unix users, that opens up a new and absolutely immense software library to the pc.

PC-DOS actually started to look a lot like Unix in its recent incarnation as version 2.0. As a matter of fact, almost all if not all of the new features that showed up in DOS 2.0 are borrowed directly from Unix, including I/O redirection, piping (a special form of I/O redirection), hierarchical file structures, installable device drivers, the configuration file (config.sys), background printing, and the filters *more*, *sort*, and *find*. Full Unix includes a slew of additional filters and utilities, as well as other features like a powerful program editor; programs can be compiled and run while you're still in Unix. It will be interesting to see how many of these other utilities and additional features appear in DOS 3.0. In any case, the two will apparently be similar enough, in terms of both user interface and what's under the skin, that moving programs and programmers between the two will be a relatively easy job.

PC-DOS will be different from both Unix and Xenix in one respect, however: Unlike its two bigger brothers, which are written in the C programming language, PC-DOS is coded in assembler. That's particularly interesting, considering that Microsoft will also be offering MS-DOS for computers based on microprocessors other than the 8086 family and those other versions will be written in C. One likely explanation for that state of affairs is that far more copies of MS-DOS will be sold for 8086 machines than for any other type. When a program is sold in such volume, it's probably worth the extra time and effort required to write it in the somewhat more efficient assembly language.

So when can you wrap your disk drive around this wonderful new operating system? The best estimates now available place Microsoft's introduction of MS-DOS 3.0 at some time in mid or late summer. Microsoft released MS-DOS 2.0 some six months or so before IBM released it as PC-DOS 2.0, so you may not find PC-DOS 3.0, complete with IBM's imprimatur on it, in your ComputerLand stores before early next year. It should be well worth the wait. ▲

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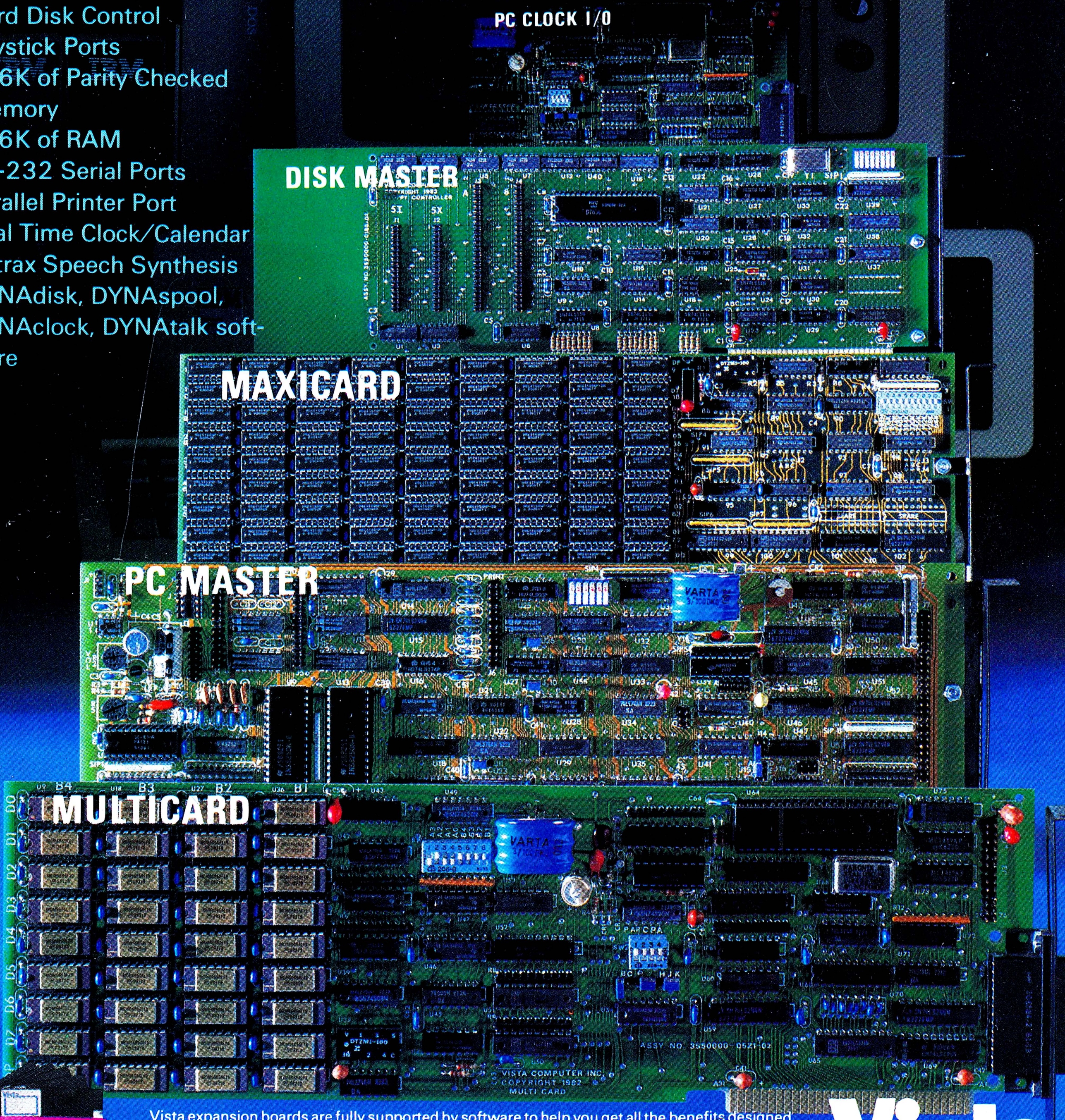

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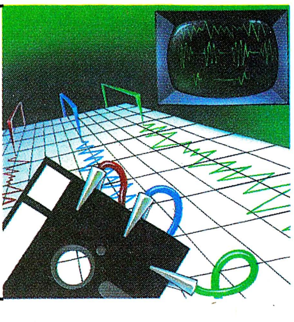

Unless otherwise indicated, software listed runs in DOS 1.1 or 2.0 with either display adapter and requires 64K and at least one disk drive.

Palantir. By Mike Griffin. The trend today is for word processors to offer a wealth of features—so many that it takes weeks for an intrepid typist to give each feature a thorough workout. *Palantir* is a perfect example. The difficult task is finding what it can't do. In *Palantir*'s case, the answer is ''not much.''

Palantir compares with *WordStar*, *FinalWord*, *Perfect Writer*, and *PowerText*—all programs that offer an almost bewildering array of editing and formatting options. *Palantir*'s are easy to learn, easy to use, and hard to use incorrectly.

The program's command syntax is built around two fundamental conceptions. The first involves the escape and enter keys. When *Palantir*'s main menu first appears, the word *edit* is highlighted. Press enter and you get the editing screen; from there, press escape and you're back to the main menu. Hit enter again and you're back in edit again, with the cursor located exactly where you had left it.

At any point in the program, escape takes you back—one level higher in the program structure—and enter takes you forward. Enter also works as a carriage return, of course (and puts a paragraph mark on the screen).

The *set* and *clear* commands constitute *Palantir*'s second fundamental syntax concept. *Set* is F1 and *clear* is F2 (*Palantir* doesn't use control-character commands).

To underline, press *set* and type a hyphen. Then type the words you want to underline, and then type *clear* followed by a hyphen. The screen promptly displays your text, now underlined. If you set an attribute (such as underlining) but do not clear it, the attribute is automatically cleared at the end of the paragraph.

A print ruler keeps you informed about what attribute you're setting or clearing; it also informs you about current page width, tab settings, justification type, insert status, and cursor location.

The cursor can be moved in a variety of ways. As in Griffin's previous opus, *Magic Wand*, a press of the home key puts you at the beginning of the current line. A second hit takes you to the upper left corner of the screen. Hitting home once more takes you to column 1 of the last line of the screen. Right cursor arrow followed by home takes you to the end of a line. You can get a new home for your cursor by hitting *set (F1) home* anywhere in the text.

Tab moves the cursor to the next word. The arrow keys move it as you would expect. The only significant omission on the cursor-movement front is back-tab; there's no command to move you back one word.

Text can be scrolled by line, screen, page, or document, and these modalities are set by means of function keys. F3 controls a direction arrow on the status line; point the arrow forward and you scroll ahead, either by line, screen, page, or document. Press F3 again to reverse the arrow and change the scroll direction.

F7 is the format key. Press it anywhere in a paragraph and the remainder of that paragraph is reformatted. Press it on the document's first line and the entire document is reformatted.

You may also *set* format. Press F1 followed by F7 for access to format parameters: left and right margins, tab stops, lines per inch, characters per inch, type of sub- and superscripting, choice of overstrike character, and type of justification. Unlike some word processors, this one lets you set a variety of formats with a single document. To simplify the handling of standard document types (memos, letters, articles, or whatever), you may save parameters in their own files and recall them as needed.

Text may be flushed right, centered, indented, underlined, double-underlined (if your printer complies), boldfaced, overstruck, split, deleted, moved or copied within a document, saved, merged with another file, subscripted, or superscripted. Pages may be numbered in any fashion that pleases, including with alternating positions for odd and even page numbers. Headers and footers are easily accomplished, and decimal tab is available to assist in number alignment.

At any point in your use of the program, help is a mere two keystrokes away. After you select help, you're shown a table of contents that offers ten topics—everything from cursor movement to ''tips and miscellany.'' Each topic contains one or more screens of information; there are twenty-five screens in all.

Although the format options and text attributes result in the insertion of special characters into your text, these code characters are

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not normally visible on-screen. You can make them visible by typing *set D* (for display). You may also print the codes along with your text, if you wish.

Another handy feature is the provision for lexicon files. Lexicon, which occupies F9, allows you to store and recall often-used phrases. Each lexicon file can contain a maximum of thirty-six phrases, each of which can be up to 250 characters long; that's enough for entire sentences or short paragraphs. Entries may include blank lines and carriage returns. Any number of specialized lexicons may be created; your boilerplate copy is, essentially, unlimited.

Function-five is for *find*. It allows you to search—either backward or forward—for characters, words, or phrases of up to sixty-four characters. Wild cards and other special characters, such as formatting codes, are permitted in search fields.

Along with *find*, you may delete or replace. Both may be done once, a specified number of times, or automatically throughout the document. You can choose "noisy" mode and watch the program make the changes or "quiet" (undisplayed) mode for zippier replacement. After the operation, *Palantir* will inform you of the number of times it found the search field.

Yet another welcome feature is *intensity*, which allows you to print each line as many as nine times. That's a godsend if your ribbons are worn; kick the intensity up to, say, three or four, and you'll print dense, black text. Or set intensity to zero (for nonprinting) and create "fill-in-the-blank" screen forms, in which only selected information is printed.

Palantir is not a single program but a collection of subprograms that shuttle in and out of memory—much like *WordStar*. Unlike some other word processors, it won't hog your RAM and leave you without room for your text. *Palantir* also uses a virtual filing technique to send portions of your work to disk as document size increases. In theory, single documents can fill an entire disk.

A file menu gives access to directory, *inspect*, *copy*, *rename*, *erase*, and *new disk*—operations that can be carried out without your leaving *Palantir*. *Inspect* allows you to call up a file and scroll by page—without losing your place in the document you're editing.

A backup option copies your file to disk, then reads it back into memory again. Backup isn't automatic, but *Palantir* won't let you accidentally destroy or delete your text; nor can you exit the program without either saving or deliberately discarding your work. The virtual filing in any case assures that most of your text will be on disk, should the cat pull your plug.

At last count, Designer Software had *Palantir* printer drivers for over forty popular and not-so-popular printers. Among those supported are the Diablo 620, 630, and 650; the Qume 5 and Qume Spring 11; all the NEC Spinwriters (including those with twin and single-sheet feeders), the NEC 8023A, the Brother, the IDS Prism, the F-10 Starwriter, the Radio Shack Daisy Wheel II, and the C. Itoh Prowriter.

Your printer is selected when you run the Install program, the first time you use *Palantir*. Install lets you choose a default printer, but you can also choose a different printer from the print menu. Install also allows you to select monochrome or color display; the mono option uses screen underlining, dual intensity, and reverse video to distinguish blocks of text and highlight commands.

Last, but certainly not least, *Palantir* comes with a *Mailout* feature—a mini-programming language that allows you to create custom mass mailings (much like *WordStar*'s extra-cost *MailMerge*).

Mailout uses nesting, variables, and conditionals. Nesting allows files to be combined during printing. Variables allow fill-in-the-blank documents with variable input at print time; and conditionals allow you to send a variety of custom documents based on variable information contained in data files.

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Here are some examples of conditionals:

IF CITY = "Smallville" . . . [do other commands]

IF SEX = "M" SET TITLE = "Mr."

IF NOT GREETING SET GREETING = "Sirs"

If conditionals and nesting sound intimidating, fear not. The manual clearly explains *Mailout* (as it does everything else in *Palantir*), and the disks come with sample files to set you on your way.

At this time, *Palantir* is available in English, Danish, and Spanish versions. An Arabic version is coming.

The program is distributed on a double-sided disk and is not copy-protected; it can be transferred to hard disk or RAM disk for enhanced speed. dc

Palantir, by Mike Griffin, Designer Software (3400 Montrose Boulevard, Suite 718, Houston, TX 77006; 713-520-8221). $450.

Shoebox. By Atlantic Software. *Shoebox* is an agenda management program designed either for individual users or groups of users. For group use it allows individual password protection as well as a coördinator feature; the coordinator feature permits one person access to the records of all system users while screening the other users from one another.

The program is suited best for the storage and retrieval of time-related information—reminders of things to be done, phone messages, appointments, recurring but easily forgotten chores, and so on. Whatever you now have stuck on the wall with a pushpin or lying about your desk on the back of a business card is a candidate for *Shoebox* storage. You can also use the program to track expenses associated with particular activities, persons, or whatever.

Shoebox records your information in two separate databases—reminders and appointments. The first of these is for items associated with a particular date but no specific time of day. The appointment database presents you with an hour-by-hour summary of your day's obligations—or a summary by whatever other time interval is appropriate for your work. This separation of time-specific and general reminders has the virtue of allowing your appointment agenda to look like a physical appointment calendar; the price of such separation is that you have to remember to check in two different places to see what's going on on a given day.

In addition to keeping dated and timed reminders, *Shoebox* provides a rudimentary accounting capability. You can switch from the schedule display of either database to an expense display. Here six fields are available: account, category, amount, comment, and two fields marked description; all are alphanumeric. The account field and the date on which an expense item is recorded may be used subsequently for selective retrieval and printout. Expense items may be keyed to schedule entries so that when you summon a printout or an on-screen expense summary you get in effect an additional 125-character comment field.

The reminder database ordinarily lists items in the same order in which they're entered, but with a little effort you can devise your own priority scheme. To do that, put any alphanumeric characters between curly brackets anywhere within a schedule item. *Shoebox* will interpret the characters within the brackets as a priority code and arrange items so marked in ascending ASCII order.

Data entry and editing are straightforward. From the schedule display—of either database—hit I for *insert* or C for *change* and you're presented with a two-line field for your item. Hitting enter steps you through various other fields: the date on which the item is to begin, the date on which it's to end, any appropriate repeat pattern, and any desired advance warning. Start and end dates default to the current system date. Advance warning may be anything up to 120 days. Dates may be specified either with numbers and slashes or by day of the week; one or two characters is sufficient to name a day of the week, and the system will pick the next date falling on a specified day.

The repeat pattern options are generous and flexible. Items may be designated as occurring once only (the default), daily, every so many days (any number from 2 to 999), once or more weekly (you specify which days of the week), once or more per month, once or more per year, or once in a while (you say exactly when). Items that recur one or more times monthly may be specified in a variety of ways: on precise dates each month (for example, the first and fifteenth), on the same day each week, or on patterns such as the third Tuesday or the last Friday or the last day of the month. The program is smart enough to accommodate virtually any pattern you require.

When you boot *Shoebox* you're presented first with the reminder database. Items whose date matches the system date are listed first; following these are any reminders from earlier dates that you haven't marked as done. These appear oldest items first, with their entry dates displayed to the left. If you get tired of being nagged by old items that you know you'll never finish, you can either lie to the system and check them off or exercise a purge option; the purge will be carried out on all live items up to a specified date and will include or exclude expense items, as you wish.

There's a search feature that will locate specific items in either database singly, as well as a history feature that will display all items matching a given criterion. The history feature allows you to use *Shoebox* as a phone log; when you return someone's phone call you can know more or less immediately what's already transpired between you and the caller. Unfortunately there's no print history option; but for that, of course, there's always printscreen.

Shoebox-supplied printed reports are available for expenses of selected dates and accounts and for agenda material from either database.

The manual is clear and includes a business-hours technical-support number. A trial call elicited articulate, friendly assistance.

The chief limitations of *Shoebox* are that it's a little slow and rather disk-intensive. You can get around the latter problem with a

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RAM drive or a program like *Cache-Q*, but you may still find *Shoebox* a trifle sluggish in operation.

It's also copy-protected. The scheme is a little unusual. You're encouraged to copy the files from the distribution disk to your own back-ups, but you have to work with the distribution disk in drive A. If anything goes awry, you're supposed to back down onto the distribution disk and try again. And if that's of no avail, you can return the distribution disk for replacement. cs

Shoebox, by Atlantic Software, Techland Systems (39 Carwall Avenue, Mount Vernon, NY 10552; 914-699-8467). $195.

Everyman's Database Primer, Featuring dBase II. By Robert A. Byers. *Everyman's Database Primer* is a book published by Ashton-Tate, the publishers of *dBase II*.

dBase II is a well-known database program with strong and continuing sales. It's a relational database that includes a powerful programming language tailored to produce very sophisticated applications. It's entirely possible to create full-blown accounting packages programmed exclusively in *dBase II*.

For people with modest data-handling needs, *dBase II* may be like going after a gopher with a submachine gun. For those who need the power, however, it's invaluable.

As you may have guessed by now, you're not going to learn *dBase II* in ten minutes.

Now a word about Ashton-Tate. These folks know how to market their wares. Dealer support for *dBase II* is thorough, friendly, and professional. Ashton-Tate pioneered the concept of demo disks that could be used for thirty days. If you like the demo, tear open the real disk and you've just bought the program. (Actually, they had your money all along, but you could get a refund by returning the unopened program disk. A variation on the "You-drop-it, you-buy-it" school of merchandising.) By the way, want an Ashton-Tate jacket? Give 'em a call; they've got your size.

Everyman's Database Primer is Ashton-Tate's newest merchandising tool. Don't be fooled by the title; this book is not really a database primer, except for the first ten pages. It doesn't merely "feature" *dBase II*; the book is about *dBase II* almost from the word go. Don't expect any evenhanded comparisons of available databases; no other commercial products are even mentioned.

(The best example of this is found in the glossary, where Pascal is defined as "a computer language having some of the features of *dBase II*." That's certainly an unusual definition of Pascal!)

Minor subterfuge aside, this is an excellent book for beginning *dBase II* users. It begins by explaining the concepts of fields and records—and even the use of the return key.

The text is clear and readable. There are lots of cartoons, illustrations, examples, and large reproductions of screen displays.

You may not be able to write a general ledger after you turn the last page, but you will have a thorough grounding in planning, building, modifying, using, and procedure and report writing with your database—oops, with *dBase II*.

While the book assumes you're using CP/M rather than PC-DOS (MS-DOS), the operating system isn't really a consideration in learning to use *dBase II*.

A glossary, a good index, and a detachable reference card for *dBase II* are included. dc

Everyman's Database Primer, Featuring dBase II, by Robert A. Byers, Ashton-Tate (10150 West Jefferson Boulevard, Culver City, CA 90230; 213-204-5570). $15.

Medman. This medical office management/database system tracks referring physicians, diagnoses, procedures, Medicare codes, insurance forms, charges, payments, responsible third parties; it ages accounts, prints reports and statements, does monthly billing, and allows integrated use of such other software as word processors and accounting packages. While the program can be accommodated on a lesser configuration, its storage capacity is more suitable to a hard disk system. Since the average medical office would require substantial storage for a worthwhile management system, a hard disk is easily justified in terms of both time and money.

Medman, menu-driven, is fairly easy to learn; running through two examples should be sufficient preparation for entering patient data. Menus guide the user comfortably through a logical sequence of data input, such as new-patient information, service provided, charges, insurance/third-party information, and print statement.

Those familiar with other systems of this kind will especially notice how certain information is "learned" as it is entered. For example, if you want to enter a new procedure and procedure code number for a patient, most programs require that you exit from patient data entry, input the code to the database, and then return to patient data entry. With *Medman*, such is not the case; names and numbers are "learned" as they are entered, a considerable timesaver.

Another timesaver is the program's ability to call up names, diagnoses, and procedures from its database with the input of initial letters sufficient to avoid ambiguity. With such partial entry, the first matching item is brought to the screen; if incorrect, the user selects the next item forward or back (in alphabetical or numerical order) or retypes enough characters to call up the proper selection directly. When a procedure is called, its corresponding code number and usual charge is also displayed, and the charge can, if you wish, be changed at this point.

If you don't wish to enter the proper procedure or diagnosis code at the time of new entry, the program assigns a temporary number. When time permits correction, the program automatically changes all corresponding temporary code numbers in all database files.

The program encourages the use of procedure code numbers, including them in statements and consequently decreasing response time from insurance companies. The program is designed to generate a patient's bill at the time that service is rendered, with the intent of speeding insurance company payments.

Statements can be addressed directly to the insurer or any re-

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For clinics or offices with several terminals, the program's comprehensive calendar/appointment book permits scheduling by modem. Further, *Medman* allows for thousands of doctors to use the same system, an obvious advantage for multiple-doctor clinics, and keeps track of each doctor, patient, transaction, and payment without complicating the system for the single user.

Another nice feature is built-in security. Multiple passwords are used to edit various levels of data. Other features include minimal typing; single-key entries, such as M or F for sex, require no enter keystroke.

Physicians considering software for their offices should certainly look at *Medman*. Its authors have designed an exceptionally efficient and useful program. bo

Medman, Galleria Micro Systems (5085 Westheimer, Suite 4700, Houston, TX 77056). $5,000.

The Dow Jones Reporter. The Dow Jones News/Retrieval service is primarily a financially oriented on-line information service that was started in 1974 and now has more than fifty-five thousand subscribers. Currently the service offers nineteen databases falling into four categories: Dow Jones business and economic news, Dow Jones quotes, financial and investment services, and general news and information services.

The IBM Dow Jones Reporter, Version 1.0, is a special-purpose communications package designed for use with the Dow Jones News/Retrieval service. Menu-driven, the program's basic structure consists of the Dow Jones Services, the Manual Entry Mode, and the Maintenance Mode, each of which can be accessed from the program's main menu.

Selecting the Dow Jones Services from the main menu allows the user to connect to the News/Retrieval service. Dial the appropriate Tymnet telephone number and the program automatically logs on to the service. Once on-line, you can access four of the service's databases: News, Current Quotes, Historical Quotes, and Disclosure II. Alternatively, you can access any of the nineteen databases manually through the News/Retrieval service command language and menu system.

The Manual Entry Mode permits two methods of connecting to the News/Retrieval service—a manual log-on procedure in which you dial the appropriate telephone number and enter from the keyboard the requested terminal identifier and password, or the automatic procedure identical to the one followed in the Dow Jones Services selection. Once on-line, users can access all nineteen databases manually or four of them under menu control.

The Maintenance Mode selection permits you to perform three different sets of tasks. You can enter or change user profile information, such as your password, which is used during automatic log-on. You can create lists of stocks or bonds used for automatically accessing the Current Quotes database (up to fifty lists, each with a maximum of eighty stock or bond symbols). And you can print or delete files saved to disk during an on-line session.

Those wanting to monitor their investment portfolios and evaluate securities will find especially useful the program's automatic log-on, stock list capability, and ability to save data to disk.

The program has a number of shortcomings, however. Its structure, for example, seems unnecessarily complicated and confusing. Functions are needlessly repeated and different menus have identical names. The required disk handling is cumbersome and excessive. Even with a two-drive system, a typical session will require inserting and removing data and program disks about ten times. Since the program is copy-protected and permits only one backup disk, such excessive handling creates considerable risk. Further, the program disk is written to during use, and you are instructed not to put a write-protect tab on it.

While the automatic log-on procedure is convenient, it will not

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work with smart, direct-connect modems that have command modes, such as the Hayes Smartmodem. Also, it works only with Tymnet, not Telenet or other telecommunications networks.

Encryption of the program, which is written in Basic, prevents knowledgeable users from patching for specific requirements, such as configuring the automatic log-on procedure for smart modems.

Data files are saved in a nonstandard ASCII format and cannot be displayed on-screen, only printed, which means that users cannot select from saved data but must print all information in the file.

The user's manual instructions on how to use the Dow Jones Services and Maintenance Mode selections are adequate, but instructions on how to log on through the Manual Entry Mode are not. A diagram of the program's structure included in the user's manual is not an accurate representation. Further, restrictions on the use of nonalphabetic characters in naming data files are inadequately explained, and the user may not be prevented from using restricted characters by means of appropriate error messages and procedures. For example, using a colon as part of a data file name causes the spurious error message "Diskette Full" to be displayed.

In addition to the software and its documentation, the Dow Jones Reporter's cost of $100 includes the initial subscription fee of $50, a password, and one hour of free introductory time on the News/Retrieval service. dh

The Dow Jones Reporter, IBM (Box 1328, Boca Raton, FL, 33432; 305-998-6007). $100.

Bulk Mailer. By Joe Marinello. Satori Software ventures into the IBM Personal Computer market with a product that flies in the face of conventional wisdom. Most publishers out there are busily creating the grandest, most versatile, most detailed database program ever. Or ignoring the whole problem. Satori has gone a different direction, isolating a problem area and addressing it with code intended for no other purpose.

In this instance, the problem addressed is one that's been a bugaboo for microcomputer owners since the dawn of Altair: How to establish and maintain a reliable mailing list. It makes no difference whether that list consists of friends, business associates, customers, or club members; getting software that easily and efficiently manages the task has been nettlesome.

Bulk Mailer handles the job with an aplomb based on the fact that that's the only job the code has to perform. You can't get out invoices, or wedding invitations, or statements, or purchase orders with it. All you can do is maintain a mailing list. It's that single-mindedness that makes *Bulk Mailer* so efficient.

In fact, the record size is so limited that it almost scares a user off. You get four address lines of twenty-eight characters and one code line of five characters. Clearly, there's not enough space there to do much besides entering mailing information.

The configuration is surprisingly versatile. Thoughtful application of the code line can enable a user to filter records of a common type with ease. In addition, the second address line of the record can be used in three ways: It can be an additional address line, printing in sequence between lines 1 and 3 as you might expect; preceded by a no-print code, it can be used to store a short comment that will not appear on the mailing label; or, preceded by a priority code, it will print before the first address line. That permits a mailer to enter a message such as "Buy now for Autumn" on the second line and have it print ahead of the mailing information on the mailing label.

Bulk Mailer has maintenance features that any regular mailer will appreciate. There's an automatic purge function that will, on request, delete exact duplicate entries. The same function will report *apparent* duplicates for the user to accept or delete. The requirement for consistency of data entry is eased when a feature recognizing apparent duplicates is implemented.

The program keeps a zip-code inventory that gives the user quick U. S. Postal Service reporting data or information on the geographical distribution of the list. In addition, the program will print last the labels from zip codes in which there are fifty or more entries, a feature that facilitates the readying of mail for delivery to the Postal Service.

Using the account number, you can find any record in the database in about two seconds. That kind of performance can be achieved because of the limited aspirations of the program. It'll only handle the number of records you can put on two disks, if you have a two-disk system, or one disk for single-disk systems. All records are on-line at all times.

In terms of record capacity, that means you can have between twelve hundred and forty-eight hundred names on-line, depending on whether your system is single-drive or dual-drive and on whether it is single-sided or double-sided.

In the works is a hard-disk version that will store thirty-two thousand names on a ten-megabyte hard disk. A utility to convert the floppy version to the hard-disk version already exists.

Think of your software library as analogous to a baseball team. Every team needs more than nine strong players to succeed. Required as well are good pinch hitters and excellent relief pitchers. Similarly with software. The library that only holds a spreadsheet, a word processor, and one of the all-purpose databases may be strong on paper, but lacks the specialization to do well in any number of critical areas.

In the past, mailing-list applications have been a primary source of user discontent. Now Satori offers *Bulk Mailer* as a relief pitcher. Users shouldn't decline the offer, any more than George Steinbrenner should refuse the chance to get Bruce Sutter. at

Bulk Mailer, by Joe Marinello. Satori Software (5507 Woodlawn N., Seattle, WA 98103; 206-633-1469). Floppy disk version, $125. Hard-disk version, when ready, $350. ▲

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newspeak

Enthusiastic heavy-metal rock fans press against the stage on Sunday, May 29, at the 1983 US Festival.

Δ **The Return of the US Festival.** Before noon on Monday, May 30, Steve Wozniak spoke to a tentful of US '83 attendees and the usual media. Toward the end of Woz's question-and-answer session, one young fellow turned to his companion and asked rhetorically, "Doesn't look like a millionaire, does he?"

Let no one accuse Wozniak of cowardice. All four days of the 1983 US Festival, he put himself on the line—fighting hard to remain optimistic while parrying a thousand thrusts from the media. Wozniak did all he could to make this year's festival work; he believed in it, he bankrolled it, he put his heart and soul into it.

Was it worth it? That depends on whom you ask. More than likely, the average concertgoers would say yes—despite the heat, the cold, the huge amounts of walking, the dust, and the so-so food.

US '83 got off to a good start, Saturday morning, May 28, with a Soviet—U.S. television link-up. With the help of a two-way satellite transmission and human translators, the famous and unfamous of both nations were allowed to exchange views and pose questions to each other. Eventually children of both countries posed questions to their counterparts. The event was refreshingly innocent—free of the usual political jockeying associated with previous U.S.—Soviet face-to-face meetings. One Soviet official, when asked what kind of music Russians like best, said, "Rock and roll."

That night, the festival crowd was treated to twenty minutes of jazzy rock music by the Soviet group Arsenal. Then the Soviets were treated to a hefty chunk of Men at Work's energetic set. Seeing the hopping and bopping Soviet rock-music fans on the big Diamond Vision and Eidaphor screens, as well as hearing their music, was a once-in-a-lifetime experience that most festival concertgoers appreciated, even though some booed the initial public-address announcement of the link-up.

Though thousands of festivalgoers crowded into the one main exhibit tent, the technology fair was a major disappointment. Only a handful of computer-industry companies showed. The majority of exhibits concerned music—everything from cars with stereos to synthesizers and drum machines.

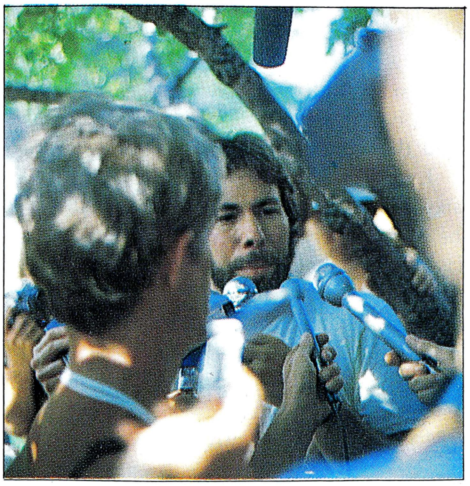
When speaking Monday morning, Wozniak said the technology fair was rushed and potential exhibitors weren't given enough advance warning. Even Apple stayed away from this year's festival, though it was present at last year's.

The crowd Saturday, May 28, was peaceful and orderly. The big headlining act that night, The Clash, was a big headache for Unuson and Wozniak. Everything about The Clash's appearance at the festival rang false. The Clash is not a good mass-crowd act. Its gritty, working-class, Marxist-tinged music comes off best in a small auditorium.

Added to this basic miscalculation on Unuson's part was a series of well-publicized incidents between The Clash and festival officials, wherein The Clash band members played the spoilers—claiming that the festival was too commercial, that they were a more suitable band for the U.S.—Soviet link-up, and that they did not have a contract with Unuson and just might not play.

In any event, before The Clash finally played there was a "really big show." Combining lasers, dozens of floodlights, a wonderfully effective make-believe alien spacecraft, film, computer graphics, and the massive four-hundred-thousand-watt sound system, Unuson took everybody on a little trip—to the Univus Festival in the rings of Saturn. Amusing, interesting, silly, spectacular, mind-blowing, ridiculous, and ideological all describe this Spielberg-like, de Mille-like extravaganza that also preceded Van Halen's performance the following night.

In a nutshell, a fictional alien having trouble finding his way home after the Univus Festival (where all the peoples of the universe get together and party), stops by our pathetic little US Festival and injects the crowd with a heavy dose of one-world, one-people, no-nations ideology. Eventually the show got bizarrely mystical, though few people seemed to mind.



Left, people traveled from all over the world to attend this year's US Festival, even from south of the Mason-Dixon line; right, Woz under fire at a press conference the afternoon before The Clash played.

Sunday, May 29, heavy-metal-music day, was alternately a disaster and a success. Both concertgoers and festival officials were tense because of the increased crowd (over two hundred thousand, though estimates vary wildly) and reports of sporadic violence.

The final day of the Memorial Day-weekend rock fest got off to a slow start and kept falling farther behind schedule as the day wore on.

By the time Stevie Nicks ended her set around 9:00 p.m., there were hundreds of small fires burning in the three-quarters-full amphitheater. To keep warm, concertgoers (many of whom had been there for ten hours or more in bathing suits) burned garbage by the armload. The local fire department was present and not pleased, but did not interfere except in the most extreme cases. Overall it was a wonderfully communal scene.

When David Bowie finally finished his set, it was close to 1:00 a.m. Tuesday. This was not good planning. In fact, many aspects of the festival seemed to be grossly miscalculated by Unuson. The organization initially projected an attendance of 1.2 million for the entire four days. Forget it. They could barely handle the four hundred thousand that did show.

Unuson's marathon concert philosophy (six or more groups on one day) tired even the hardiest festivalgoers. Even the Saturday, June 4, country-music day didn't finish till after 1:00 a.m. Had the weather been warmer, the late nights wouldn't have been so bad.

Was it worth it? Woz says yes and that he's thinking about doing another festival in 1984, if he can get other backers besides himself. How they'll make it commercially successful remains to be seen, but Unuson learned some hard lessons this time around.

Δ **Everything Under the Sun.** Who would have thought it could happen? The pride of the world computer industry rolled into Anaheim, California, for the annual NCC (National Computer Conference) and four days later rolled out downright angry at (or, at the very least, disappointed with) the management of the show.

Now you've heard the bad news, reasons for which we'll come to in a moment. The good news at the 1983 NCC, held May 16–19 at the Anaheim Convention Center and the Disneyland Hotel Convention Center, was that its size and scope indicated a generally healthy American computer industry, notwithstanding the impressive showings by Japanese, Australian, French, and other overseas computer firms.

IBM, Xerox, Intel, Apple, Vector Graphic, VisiCorp, Sperry, Perkin-Elmer, Motorola, Fortune Systems, Bell & Howell, and hundreds of other American computer companies brought out their snazziest booths and their most attractive sales personnel. The circus had arrived and the southern California masses poured in, ready to be seduced, amazed, and flabbergasted by all the wonderful gadgetry.

What they found was a lot of networking and telecommunication products and services. They also found what you'd expect—business, business, business. IBM broke up the monotony with its 7565 manufacturing robot, housed in a rectangular metal frame. And to many exhibitors, business meant splash and finesse, showgirls and magicians, giveaways and more giveaways, movies, and demos aplenty.

As several exhibitors noted, a large number of attendees this year were average local citizens with little or no computer experience. One can only wonder what they made of this four-day computer orgy and its openly acknowledged confusion. Does anyone know how long it takes to evaluate a hundred brands of microcomputers?

The answer, of course, is don't go to NCC to choose; go to a computer store. But where can you find a computer store that stocks that many brands?

It's probably good that only some eighty thousand people a year attend a show like NCC. If there were twelve NCCs per year in twelve different cities, there would be that many times as many confused consumers, most of whom would probably give up trying to make an informed decision and settle on the micro with the slickest TV ad.

Some companies make no bones about it and simply ignore the potential end user. NCC is, after all, a place to do business with other businessmen, a place to make contacts and make tentative deals (and check out the competition). Who needs all those novices?

But to other exhibitors, the steady stream of attendees is the main reason for being at NCC. Many of the smaller companies—the

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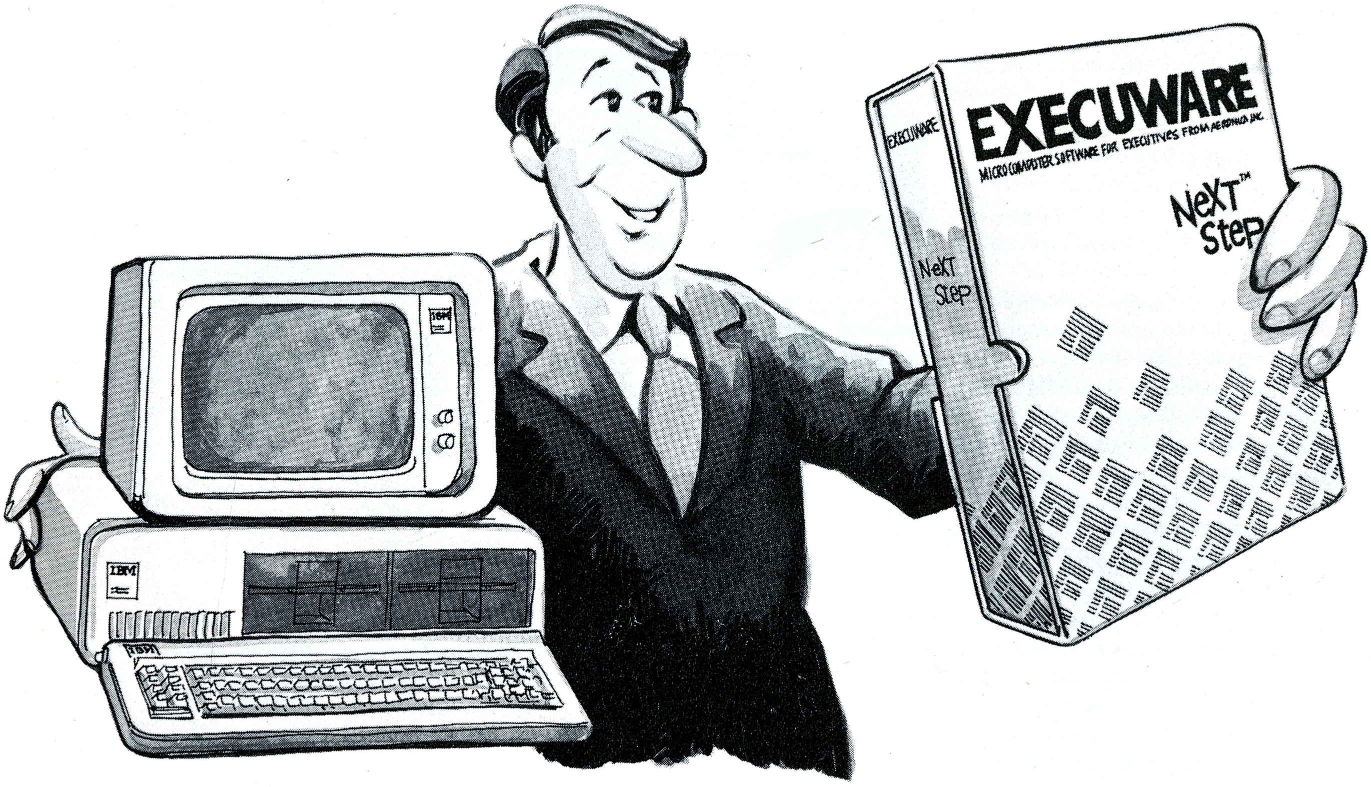
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ones with the unroofed booths—are trying to create an image at an affair like NCC. They prepare like crazy for a show that's probably too expensive anyway and then wait for the crowds to come bopping in.

This year some of the companies that could least afford it got badly burned—literally as well as figuratively. The show was too big for the Anaheim Convention Center, so six interlocked, giant, hot-dog-shaped tents were set up in the parking lot. Inside the tents were more than three hundred exhibit spaces, most of which were small—one tenth the size of Apple Computer's plywood temple. Around two hundred additional booths were located in the Disneyland Hotel's convention center. On day two of the show, the temperature outside broke a hundred degrees and the air conditioning in the tents didn't hold up.

Jim Spillars, vice president of retail operations at Microsoft, was in charge of a booth out in the tents. His story typifies the misery of that day.

"Our big-screen projection system failed at 102 degrees. The computer flickered at 105, and we turned it off. A couple of people fainted in the booth. It was a freak thing. Better planning would have solved some of it. Everything possible that could go wrong went wrong."

You may have heard the story of the salesman who made shorts of his suit pants by cutting off the legs. Tuesday, May 17, was that kind of day. Weary attendees poked their heads into the tents after trekking under the hot sun and turned right around. On Wednesday, a meeting took place between exhibitors and the American Federation of Information Processing Societies (AFIPS), management for the show. No alternative plan was adopted. AFIPS apologized and promised to make some kind of amends. A good many exhibitors thought that this response from management was inadequate and began talking of class-action suits.

Microsoft's Spillars, who says he was constantly missing appointments at the booth because of the heat, said he was "obviously disappointed," but, like most of the other exhibitors at this year's NCC, he plans to be back for next year's show (in Las Vegas next July).

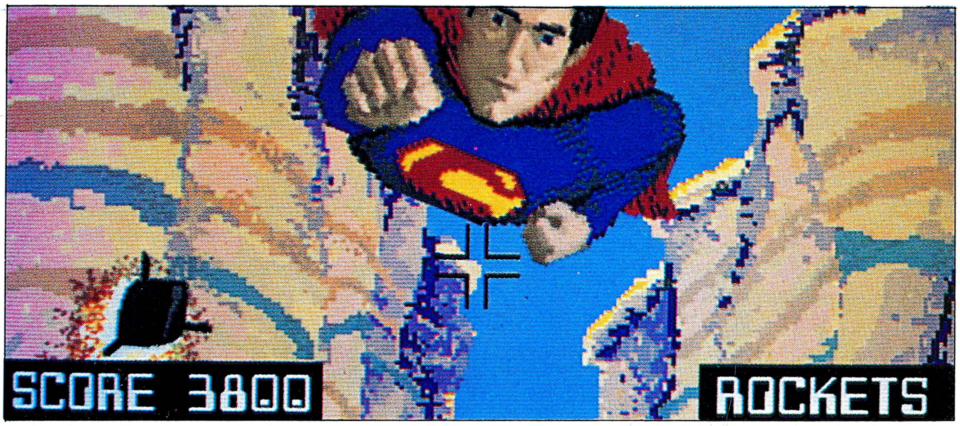
Δ **Computerized Man of Steel.** The folks at Atari are doing more than designing home and arcade video games. The Special Programs Division, headed by Steve Wright, recently worked fourteen weeks to create a sequence for one of the summer's special-effects blockbusters—*Superman III*. Wright calls their division's work "computer visualizations" (a fancy name for stop-frame computer animation).

The sequence involves that portion of the film where the Man of Steel does battle with the Ultimate Computer, described in the film by computer wiz Gus Gorman (Richard Pryor) as "the world's first stone-killer-diller get-down, get-it-on and twice-on-Sunday supercomputer." Atari's footage, which shows up on a computer monitor in the film, has images of Superman flying through a canyon as rockets explode all around. Everything on the monitor, including the Caped Wonder himself, was generated on a sophisticated computer system made by Atari.

"Warner Bros. [like Atari, a division of Warner Communications] wanted the sequence to convey the spirit of a super mega-videogame of the future," explains Wright. "They asked us to provide graphics that would resemble closely how a coin-op arcade game might look several years from now."

Software manager of Special Programs Pat Cole (one of several designers of the spectacular computerized Genesis sequence in *Star Trek II: The Wrath of Khan*) says, "I suspect they [Warner Bros.] thought we'd be able to produce it on the same kind of machines we use for games. They really lucked out, because our Special Programs Division has been developing a number of tools using more sophisticated computers. We were able to use those tools with some additional software to produce the sequence."

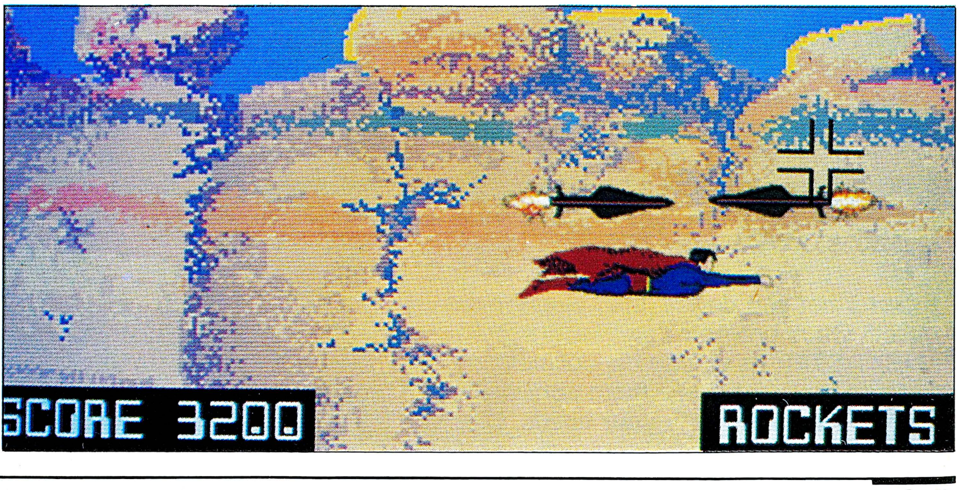
The Disney films *Tron* and *Something Wicked This Way Comes* used three-dimensional computer animation images—images that had volume and shadow characteristics—in an attempt to simulate real life. Atari's *Superman III* computer footage, in contrast, intentionally carries the look of low-resolution graphics; it achieves what is now called 2-1/2-D—flat images enhanced by a few visual tricks to provide a suggestion of depth.



The climax of Superman III *finds the Man of Steel racing to confront an evil, malicious Robert Vaughn, who is protected by the Ultimate Computer. Buzzing through the Grand Canyon, Superman is attacked by missiles that Vaughn controls with a video game-like setup. The images above and below were created by Atari and show what Vaughn is seeing when he is attacking Superman.*

"The extra depth is where the 1/2 comes in," says Cole. "We had a different set of challenges than the work on *Star Trek II* presented. If it looked too real, we'd have failed. Our effort was to firmly establish a look of video games, but not any game you'd see on Earth today."

The concept of 2-1/2-D is similar to the multiplane animation pioneered by Disney Studios in the late thirties. That approach called for an artist to paint a scene on several sheets of glass. On the back sheet would be mountains; the second from the back would show trees, the third might have a car,



and the sheet closest to the observer would display a human or animal character. An illusion of depth was created, because the car could pass behind the person and objects further from the camera appeared slightly out of focus—as they would in reality.

The added "computer visualizations" in *Superman III* cost Warner Bros. roughly ninety-five thousand dollars in equipment and nearly four months of production time. It took ten weeks to prepare the program and another four to shoot the twenty-six seconds of film. But what a sequence!

Atari's Special Programs used an Ikonas Frame Buffer computer to create the sequence and did it at much lower resolution than the system is capable of. The first step was to create a piece of software that would allow the Atari designers to see how their animation would look. This software came in two parts: a paint and animation program to create the visual images and a script and sequence controller that enabled the designers to write a script outlining what the objects were to do.

For example, a shot was scripted and then recorded with an elaborate stop-frame video unit called a Lyon-Lamb Animation Controller. This hardware device allowed them to record the sequence, one frame at a time, onto two Sony 3/4-inch broadcast-quality tape decks. It took the Ikonas an hour or two to calculate and process all the low-resolution graphics in the scene onto video tape so they could be viewed one frame at a time.

Once the look of the sequence was settled, a medium-resolution "take" was shot onto 35mm film by means of a Dunn Instrument Camera. The camera, called a Dunn box, contained a high-resolution black-and-white monitor with a custom-modified 35mm Mitchell camera precision-mounted for recording the images onto film. Production of the box to meet Atari's custom specifications cost $35,000; and it took the computer four to five hours to process a single frame.

Under automated computer control, each frame was displayed on the Dunn monitor in black-and-white separations, analogous to the method used for the rear projection compositing of matte paintings or to the storing of negatives to prevent their fading. Each black-and-white separation was photographed by the Mitchell through the appropriate red-green-blue Kodak gelatin filter to combine the elements into a full-color image.

The computer sent the image to the hi-res black-and-white monitor, and the camera photographed the single picture in three passes. First, the Dunn box sent the image of red information to the monitor's screen and then the camera photographed it with a red filter over its lens. With the film stationary, the filter rotated to green as the green line was imaged on the monitor and the second picture was taken.

After photographing the blue line in like manner, the camera advanced to the next frame and the entire process was automatically repeated. By keeping the frame of film stationary for the three takes, perfect registration was achieved.

When everything checked out on the medium-resolution film, a final run of the scene was made in high resolution (that is, as high as the scene's semirealistic requirements would allow). This process consumed an additional twelve to fifteen hours per scene.

A few interesting side effects emerged from this rigorous process. Because the film was shot in Panavision format, the proper 2.35-to-1 aspect ratio was achieved via software programming rather than through anamorphic lenses on the camera. In other words, Atari "squeezed" the image to Panavision through by means of an anamorphic software package, without worrying about the distortion that might arise from shooting through an extra piece of glass. This method could find its way into the arcade world; game manufacturers might actually market their games in Cinemascope for future projection television sets modified for anamorphic wide-screen images.

As of this writing, the Atari consumer-electronics division has no plans to market the special programs division's work on *Super III*. There are, however, plans to produce a 400/800/1200 Superman game to run on the Atari home computers. The *Superman III* game, of course, won't look anywhere near as good as the special-effects footage in the movie.

Δ **Do You Speak the Language?** There is a tendency in this country to expect everyone and everything foreign—from imported products to visiting journalists—to cater to our linguistic needs. Americans, however, often fail to extend the same courtesy abroad, says Hani Khouri, president of Language Management Corporation of Monmouth Beach, New Jersey. On this issue, Khouri feels we have a lot to learn from the Japanese.

"They know about the marketplace, and they translate everything. When's the last time you bought a Sony television with an owner's manual written in Japanese?"

Khouri, who speaks English, Arabic, Spanish, French, and Portuguese, decided to do something about the need for better ways of translating English into other languages. When his company opened its doors two years ago, work was begun on a computer-

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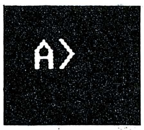

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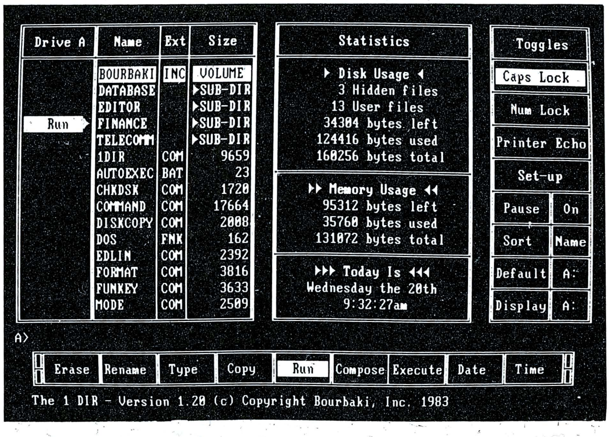

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          AUTOEXEC  BAT       23                            Set-up
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          DOS       FNK      162    131072 bytes total    Sort    Name
          EDLIN     COM     2392
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ized system for translating English into Arabic.

Khouri says Arabic was the logical starting place. Even though there are more than one hundred thirty million Arabic-speaking people in the world, they constitute a much-overlooked market, he says. Also, many large American corporations already transact a lot of business in the Arab world, and these interactions demand speedy translation of significant amounts of paperwork.

Besides having potential benefits for the Arab speakers of the world, Khouri's system could find much use in the States.

As of January 1, Arabic became an official language at the United Nations, which means that everything in the archives of that organization must now be translated into Arabic. Currently, a crack U.N. translator can cover a little more than two thousand words a day. LMC's "Arabization," running on a Digital Equipment Corporation minicomputer, can do about eight thousand words every twenty-four hours.

At LMC, English text is entered into the computer via magnetic tape or optical scanner, or it's keyed in from written documents. Once text has been entered, a vocabulary search begins. If a word or idiom is not included in the four-hundred-thousand-word Arabic dictionary/database, its equivalent is manually checked in published sources.

Next an Arabic linguist and an editor familiar with the subject matter decide on the correct Arabic meaning before the word or phrase is added to the system's dictionary.

The program is so well designed, says Khouri, that it can choose words based on a concept. Dialect, degree of formality, cultural appropriateness, and educational level are also taken into account. LMC relies on a team of subject matter consultants and language researchers fluent in both tongues.

Khouri feels that his company is definitely helping to bridge the language gap, at least in the Arab world. Before moving on to other languages, LMC hopes to perfect a voice synthesizer for inputting and outputting Arabic. Khouri admits this won't be easy. "Arabic is a tough language to handle, even for human beings," he says.

Δ **Take the Money and. . . .** Not all computer crimes are performed by agents in the employ of foreign companies or star programmers seduced by the call of Mammon. A recent incident in the state of Washington showed that ordinary individuals are also capable of casual computer crimes and that these crimes can cause a great deal of harm.

On March 11, 1983, while working as a programmer/analyst with Washington's Division of Vocational Rehabilitation, Stanley V. Slyngstad of Olympia was arrested on the job. For ten months prior to his arrest, Slyngstad had diverted funds set aside to train the handicapped for new careers. Between April 1982 and last February, Slyngstad used a special program to issue twenty-five unauthorized checks; the checks amounted to $16,923, and most of this amount went directly, if temporarily, into Slyngstad's own pocket.

Slyngstad's crimes were discovered by accident. An accountant routinely examining one of the DVR's "remittance advices," which provide a record of all the agency's check authorizations, noticed that the address on the document was that of Stanley Slyngstad. Twenty-two checks in all had been made out to Slyngstad and mailed to his home address. The other three checks had been given to a drinking buddy, who used the money to make a down payment on a pickup truck.

A number of publications picked up the story and played it as a sort of Robin Hood fable—a colorful crook ripping off the establishment to aid the downtrodden. Leslie F. James, director of the Division of Vocational Rehabilitation, has a different view.

It's James's opinion that Slyngstad spent most of the money himself. Slyngstad spent a good deal of his spare time at Charlie's, a local tavern, where he sometimes left hundred-dollar tips. There, in James's mind at least, lies the origin of the problem. He insists, "I don't think any of this would have happened if Stan hadn't started drinking."

Slyngstad himself was quoted as having said, "I used my own money until it ran out. Then I used the state's—an unlimited supply. I was blatant as hell."

The question now is not so much why it happened as how—and how to keep it from happening again. James is trying to keep an open mind, saying that it's important not to become suspicious of computer programmers as a group because of this case. But he remains pessimistic. "I don't think it is combatable. Anyone who knows your system well enough to make it work for you knows it well enough to steal from you."

State Patrol Lieutenant Fred L. Filon, however, has a more positive attitude. He says he's confident that everything taken was also discovered.

Slyngstad, who had worked at DVR since 1978 and who was highly regarded there, has been ordered to keep away from his state computer terminals pending sentencing. As a result of his $17,000 heist (he pleaded guilty to first-degree theft last April in Thurston County Superior Court), Slyngstad has lost his $30,000-a-year job and faces up to ten years in the slammer.

Δ **Not a Real Conference, but an Incredible Simulation.** The 1983 Summer Computer Simulation Conference (SCSC) will be held July 11–13 at the Hyatt Regency in Vancouver, British Columbia, Canada. Sponsored by the Society for Computer Simulation, SCSC will feature more than forty sessions, with original papers covering the field of computer simulation. Five special presentations—including Robotics and Simulation, Discrete Simulation, and Design of Direct Execution language for Interactive Simulation—and several state-of-the-art presentations by experts on such subjects as supercomputers and simulation languages are the main courses on tap. The Society for Computer Simulation, based in La Jolla, California, is a technical group dedicated to the advancement of simulation and allied computer arts in science, engineering, mathematics, education, government, and medicine.

Δ **Chips in Heat.** Physicists at the National Aeronautics and Space Administration's Lewis Research Center in Cleveland, Ohio, have come one step closer to realizing the dream of "hot chips." The reason that until now it's been impossible to implant electronic chips in high-temperature environments, such as jet engines, is that the microscopic electronic webs of which they're made are destroyed at temperatures above 600 degress Fahrenheit. Most chips found in computers are made of silicon that's been doped with traces of other elements, such as boron. Back in the fifties, researchers decided that a silicon-carbide-based chip would be able to endure temperatures as high as 1,600 degrees Fahrenheit. Because silicon and silicon carbide have different crystalline structures, the work of building a crystalline layer of silicon carbide onto a silicon base has dragged on for more than two decades. Two years ago, physicists at Lewis proposed to lay a third layer made of irregular silicon carbide crystals—to act as a bridge between the silicon and normal silicon carbide. These same researchers have used silicon carbide produced in this fashion to build diodes and other devices. NASA wants to use hot chips inside experimental turbine engines for monitoring and control purposes. Other applications are, as they say, in the wings.

Δ **Universal Games.** MCA Video Games, the video game licensing arm of MCA Inc., has joined forces with Atari to form Studio Games. Last year, MCA Video Games worked with Atari on the home video game of the film *E.T.*, and the new joint venture should facilitate further projects of this nature. Under terms of the agreement, Studio Games will create coin-operated video games, home video games, and software based upon motion pictures, television, and other properties developed and proposed by MCA. Studio Games will be headquartered in Sunnyvale, California, and will operate an office in southern California's Universal City. Executives from Atari and MCA Video Games will manage the joint venture.

Δ **The Radio Strikes Back.** Nobody was more skeptical than radio talk-show host A. J. Austin of WAVI radio in Dayton, Ohio, when the station started an experimental half-hour talk show on computers. Even though he had owned an Apple for over a year, Austin wasn't sure that people would take a radio show on the subject. Since then his eyes have been opened. On June 4, *Computer Talk*, which has expanded from a half hour to two hours every Saturday morning, celebrated its first birthday. Members of local user groups were featured on the air that day, and prizes and software were given out by Austin. Each week, *Computer Talk* offers a computer news report, in-studio and telephone interviews with important industry figures, a segment devoted to new products, news of user group meetings, software and hardware reviews, and an open phone forum.

Δ **Looking for Future Rookie Sensations.** The fortunes of the San Francisco Giants ought to be a little brighter this year. No, they didn't make any big trades or pay megabucks for some aging superstar. The Giants are expecting big things from their new microcomputer-based scouting system. Using a Fortune 32:16, 68000-based, Unix-equipped, general-purpose business computer and a scouting program designed by United Data Corporation, the Giants' management can now retrieve every scouting report and analysis ever made on a given player. Each player record includes the usual "objective" numbers as well as subjective evaluations supplied by scouts. Information is fed into the system continually from several different terminals and, at present, the system can maintain five thousand records, a capacity that eventually will be tripled.

Δ **Penney for Your Videotex Thoughts.** J.C. Penney may be getting into the videotex business. You may never have to go stumbling through the shoe department again. The surprise announcement that Penney plans to acquire First Bank System's home videotex system, called FirstHand, coincided with the temporary shutdown of FirstHand, which was being used on an experimental basis by more than two hundred fifty farms in North Dakota. First Bank System, based in Minneapolis, Minnesota, commissioned the development of FirstHand. French Teletel videotex technology (France is the world leader in advancing videotex technology) was imported for the project. When FirstHand comes back on-line it will depend heavily on banking and will be tied into banking institutions. So far, it seems, an emphasis on practical applications is the only route to a commercially successful videotex system. ▲

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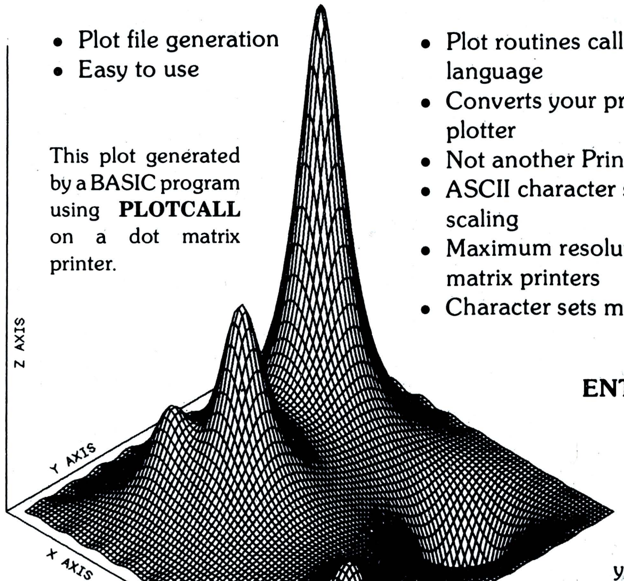

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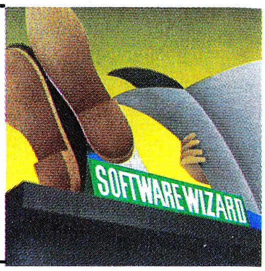
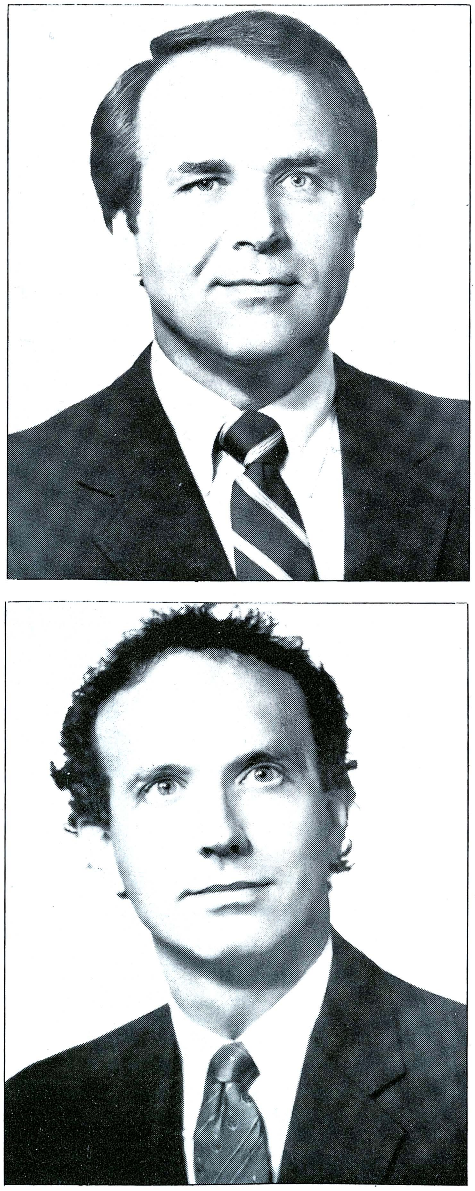


Δ **Corona Data Systems** (Westlake Village, CA) has appointed **Richard J. Tata** vice president of operations. He will report directly to company president Daniel R. Carter. Prior to joining the company, Tata held the same position at Powertec. Altogether, he's spent twenty-seven years in the business. "Dick's twenty-seven years of related operations experience in the computer industry, plus his drive and desire, are necessary to help us meet the challenges our company faces," says Carter.

Δ The electronic and technical publishing division of **Harper & Row** (New York, NY) has announced it has agreed on terms for publishing a series of books with **InfoWorld** (Palo Alto, CA). The first six books planned will contain reviews of software and hardware, each for a specific machine, including the pc. Writers will be the staff of the micro newsweekly and its copublication *InfoWorld Report Card*. Maggie Canon, *InfoWorld* editor-in-chief, says she "looks forward to publishing some bestselling computer books." Δ Also at Harper & Row, **Jane Isay** has been named vice president and director of electronic and technical publishing. Formerly copublisher of Basic Books, Isay created Harper & Row's electronic division last September. Home, professional, and educational software for a variety of markets will be produced, both for standalone purposes and for accompanying Harper books. The division will publish six microcomputer books in spring 1984 along with the *InfoWorld* series.

Δ **Carlton "Corky" Hall** has been appointed distribution sales manager at the **MNC International** (Minneapolis, MN) software sales division. Hall had been an independent consultant for business on micros, minis, administration, and personnel. Δ **Rachel Lanners** has been chosen supervisor of software distribution for the company. She had held the same post for R2E of America, and previously worked for Electro-Craft and Carlson Companies. Δ The company itself was picked as regional distributor for **Digital Research**. They will distribute the DRI's licensed software in a five-state area—Minnesota, Iowa, Wisconsin, and the Dakotas—in addition to providing the telephone technical support.


Henderson and Matte share Easitech vision.

Δ Two key executives of **Quadram** (Atlanta, GA) have resigned to head newly formed **Easitech**. **Gary Matte**, a top sales executive, and **Charles Henderson**, Quadram's director of marketing communications, are now, respectively, president and vice president of the new company. Easitech will market pc enhancements exclusively through authorized IBM dealers. Matte is credited with having cemented most of Quadram's prestige retailers, including Photo & Sound and Macy's. A former retail computer store manager, Matte has a twelve-year computer background, with stints at NCR and Honeywell. Before joining Quadram, Henderson headed consumer marketing campaigns for the motion picture industry; the Tim Conway-Don Knotts movies were among his successes. Easitech is funded by an initial sale of capital stock and a large line of bank credit.

Δ A national probability survey and analysis of personal computer usage in business and the home will be undertaken by **Arthur D. Little** (Cambridge, MA), the international research and management consulting firm. Researchers will survey approximately thirty-five thousand respondents quarterly on a continuing basis. The company says the survey is the first of its kind in the world and is designed to help companies make product and market planning decisions based on statistically reliable primary research data. Subscribers will share the cost of the survey service at annual fee levels ranging from $30,000 to $90,000, enabling them to enjoy the benefits of a major research program at "a reasonable price," according to a company spokesman.

Δ With more than eight years of sales management experience, **Cliff Hall** has been appointed national sales manager at **Eagle Software Publishing** (Wayne, PA). Hall will coordinate the firm's growing network of distributors, OEMs, and manufacturing representatives.

Δ Graphics software for micros in the German-speaking market will be published by **Decision Resources** (Westport, CT). In an exclusive agreement with **Telecomputer Micro-Shop GmbH** (Essen, West Germany), the company will produce a German-language version of *Chart-Master* with a full German character set for the program's instruction menu. Telecomputer will translate the program's manual.

Δ In an agreement signed with **Boeing Computer Services** (Vienna, VA), **MicroRIM** (Bellevue, WA) will be marketing its relational information management database to *Fortune 500* companies. "We are pleased to be working with Boeing," says company president **Wayne Erickson**. "We anticipate this arrangement will significantly increase our market penetration, and we feel confident MicroRIM will enhance Boeing's product line." Δ MicroRIM has also entered the local area network market, announcing the signing of an agreement with **Nestar Systems** (Palo Alto, CA) to provide the company's database in multiuser environments for Nestar's Plan 4000 system.

Δ Los Angeles Mayor Tom Bradley cut the ribbon at the ceremony celebrating the new corporate offices of **Innovative Computer Products** (Chatsworth, CA). The company is one of many high-tech firms who have chosen to relocate in the west end of California's San Fernando Valley, rival computer territory of the San Francisco Bay Area's Silicon Valley. New address: 9174 Deering Avenue, Chatsworth, CA 91311.

Δ The first in a family of operating systems written in C from **Digital Research** (Pacific Grove, CA) has been licensed to **Hitachi America Limited** for its HD68000 microprocessor. The operating system, dubbed CP/M68K, is designed to broaden the base of computers capable of using CP/M, and to provide a bridge for transporting applications written in C between Unix and CP/M systems. According to a Hitachi spokesperson: "CP/M68K will serve a wide range of commercial, industrial, and scientific applications. It fills the gap between larger, more expensive, hardware-intensive operating systems and small, nonfile-oriented ones." Δ Digital Research has also signed a licensing agreement with **Eagle Computer** (Los Gatos, CA) to supply the firm with the entire operating system product line, to be installed in Eagle's 1600 micro series.

Δ **John Viega**, formerly operations manager, has been promoted to director of operations at **Advanced Logic Systems** (Sunnyvale, CA). He will direct production, purchasing, quality control, shipping, and receiving. Viega's experience in the electronics industry spans more than a decade. It began at Cal Computer and has since included National Semiconductor, Apple Computer, and Imagic. He is also a former bimonthly contributor to *Electronic News* magazine.

Δ Entering the field of electronic publishing for the first time, trade book publishers **E.P. Dutton** (New York, NY) will publish a line of books with software or videotapes and disks on the side. A combination of technical and entertainment subjects like solving mysteries, creating riddles, understanding and forecasting weather, and organizing the home computer system have been announced. **Jack Sibrizzi**, former director of operations, has been named director of electronic publishing. "Some of the material," Sibrizzi says, "will be adapted from titles under contract. The software will be produced by groups working in the same capacity as authors. Hi-res graphics will be an integral part of the packages."

Δ **Control Data** (Minneapolis, MN) has invested in **Source Telecomputing** (Pleasantville, NY). Under the terms of the investment, two of the company's senior officials have joined the five-member Source board of directors. The two are **Walter H. Bruning**, vice president of data services, and **Thomas W. Miller**, vice president of business development. According to Bruning, "The Source offers real potential for us in expanding the channels for computer-based information services to individuals and business enterprises." Control Data operates the world's largest data services network, providing scientific, engineering, and business time-sharing services.

Δ Approval to sell printers to all agencies of the federal government has been granted to **Micro Peripherals** (Salt Lake City, UT) by the **General Services Administration** (Washington, D.C.). Under the agreement, the company will make its products available to all civilian agencies, the Department of Defense, Congress, and the federal courts. Sales are expected to be substantial because of a buy-American fever currently raging in the nation's capital.

Δ A founder of **Dataquest** (Mountain View, CA) has created his own research and consulting organization. **Dr. William L. Coggshall** will helm **Software Access International**, a company that will collect data, measure, analyze, and report on the microcomputer software industry. The company plans to create databases of the industry's products and participants in this highly fragmented market. Coggshall says of the industry: "With its diverse distribution channels, its gaggle of tiny companies, and its fast-paced growth and change, the industry looks chaotic even to the most seasoned industry executives."

Δ Two additions to the general publishing division computer group staff have been announced by **Prentice-Hall Publishers** (Englewood Cliffs, NJ). **John Hunger** has been appointed senior editor, coordinating the development and marketing of software. Since 1977 Hunger has served as business and technical editor for the Spectrum Books division. Δ **John Kilcullen** has joined the marketing department, where he will concentrate on the development and implementation of computer book and software marketing programs.

Δ A new executive structure affecting most areas of **ComputerLand** (Hayward, CA) now divides all domestic operations into line (income-generating) or staff (general support) functions. Line departments will report to

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Michael Shabazian, senior vice president, and staff functions to Gary Gapp, vice president of finance and planning. "We find that we have to re-create the company every six months," says Edward Faber, president. The company expects to reach a billion dollars in sales this year, nearly ten times its 1981 total of $151 million. Δ **Roger Lewis**, a former senior vice president at the J. Walter Thompson ad agency, has been named vice president of advertising. Lewis fills a vacancy brought about by reorganizing the marketing department into advertising and communications. Δ Formerly in charge of product operations, **Marian Murphy** has been named vice president of franchise relations. Murphy's old post will be assumed by **Kenneth Waters**, former vice president of development. Δ The development department now comes under the purview of **Robert Bruce**, director of development.

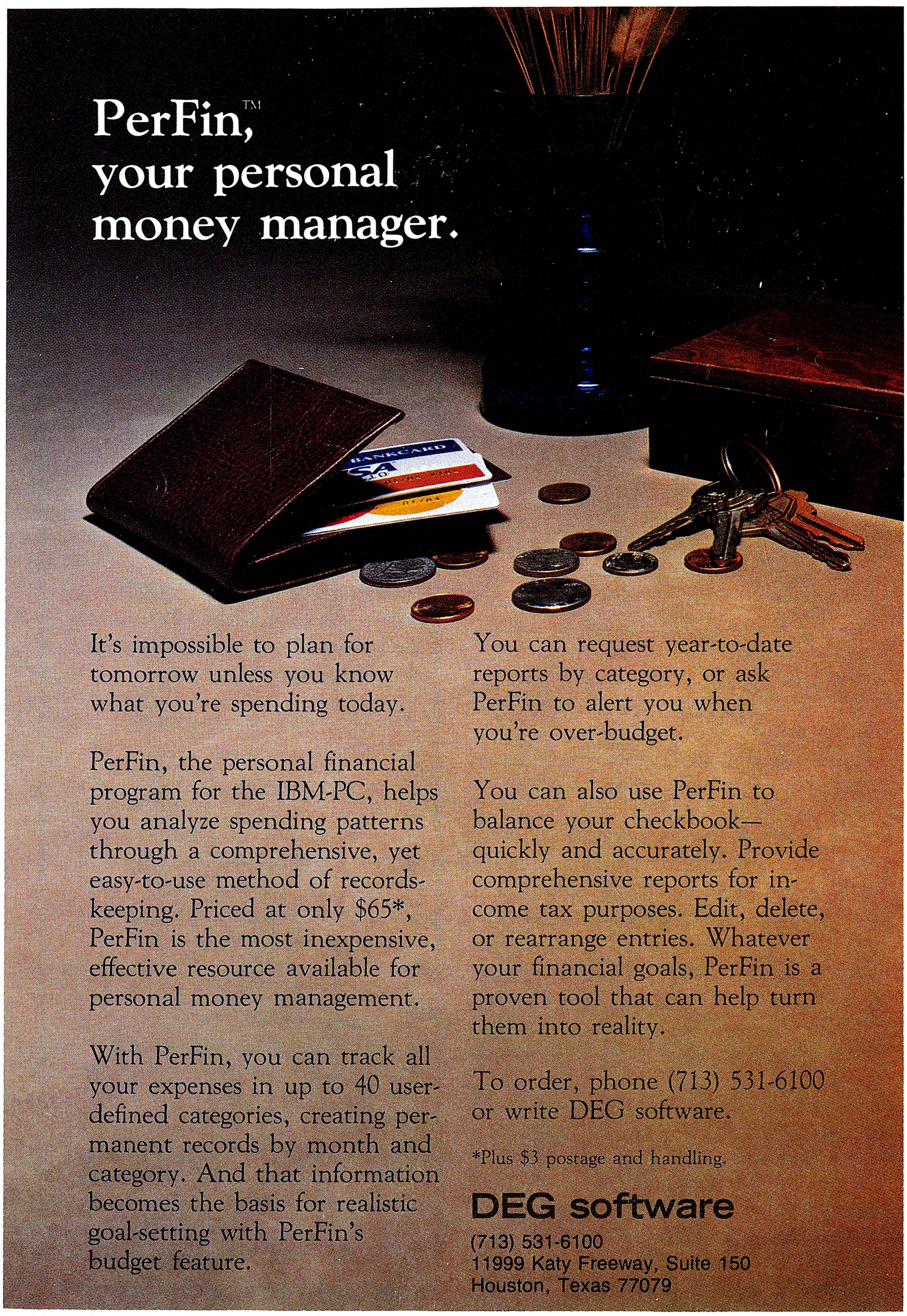
Δ **Spinnaker Software** (Cambridge, MA) has signed up three new authors for its educational and entertainment line of software for home and school use. They are **Jean Rice**, **Frieda S. M. Lekkerkerker**, and **Kenneth S. Madell**. Rice has authored several textbooks, including *My Friend the Computer* and *Computers Are Fun*. She is also founding president of the Minnesota Computer Society. Lekkerkerker, who has taught at both the secondary school and university levels, has produced *Kids on Keys*, a read, write, and type program. She is a native of The Hague, The Netherlands. Madell is a former premed student and a professional musician. He has produced a multiplayer word game called *Catchword* and is the author of *The Visible Solar System* game for Commodore International.

Δ **Digital Research** (Pacific Grove, CA) has selected **Software Distributors** (Culver City, CA) to launch a major applications building program targeted at the professional productivity market. Under the program, Software Distributors will bundle pc and XT software with Digital's Concurrent CP/M-86 operating system. The purpose is to transform the IBMs into powerful workstations, without users having to load and unload software each day. Δ An agreement has been reached whereby Digital will support the *VisiOn* operating environment created by **VisiCorp** (San Jose, CA). Under terms of the agreement, DRI will work with personal computer manufacturers to adapt *VisiOn* software for CP/M systems. Both companies have been working with OEMs on *VisiOn* and CP/M systems, and product announcements are anticipated.

Δ *The Microsystems Segment Analysis Service* will provide ongoing research and analysis of the microsystems market, according to **Infocorp** (Cupertino, CA), which has introduced the service. It will provide focused, in-depth information for specific market segments, including an ongoing quarterly survey of the major micro distribution channels. Supporting the company's staff of seasoned industry analysts is a comprehensive model-by-model historical database built on primary research of manufacturers, distribution channels, and end users.

Δ A new distributor, **Software International** (Tokyo, Japan) has been formed to distribute software in Japan. The full-line organization offers full service and support as well as sales for business, software and compilers, utilities, and communications. The firm's parent company is Japan Systems Engineering, the Japanese representative for Ashton-Tate, Chang Laboratories, Woolf Software, and others. Founders of the new company are **Hidechika Kobayashi**, president; **Bill Smale**, executive vice president; and **Toshihiko Funayama**, executive vice president. Kobayashi was formerly general planning manager of CSK, the largest software house in Japan. Smale was formerly distribution manager at Digital Research. Funayama was formerly general planning division manager for Commodore Japan. Among the company's subdistributors are Lifeboat Japan, Microsoftware Associates, and ASCII Consumer Products, all of which sell directly to users as well as dealers. ▲

Items for this column can be submitted to Tradetalk IBM, Softalk Publishing, Box 60, North Hollywood, CA 91603.



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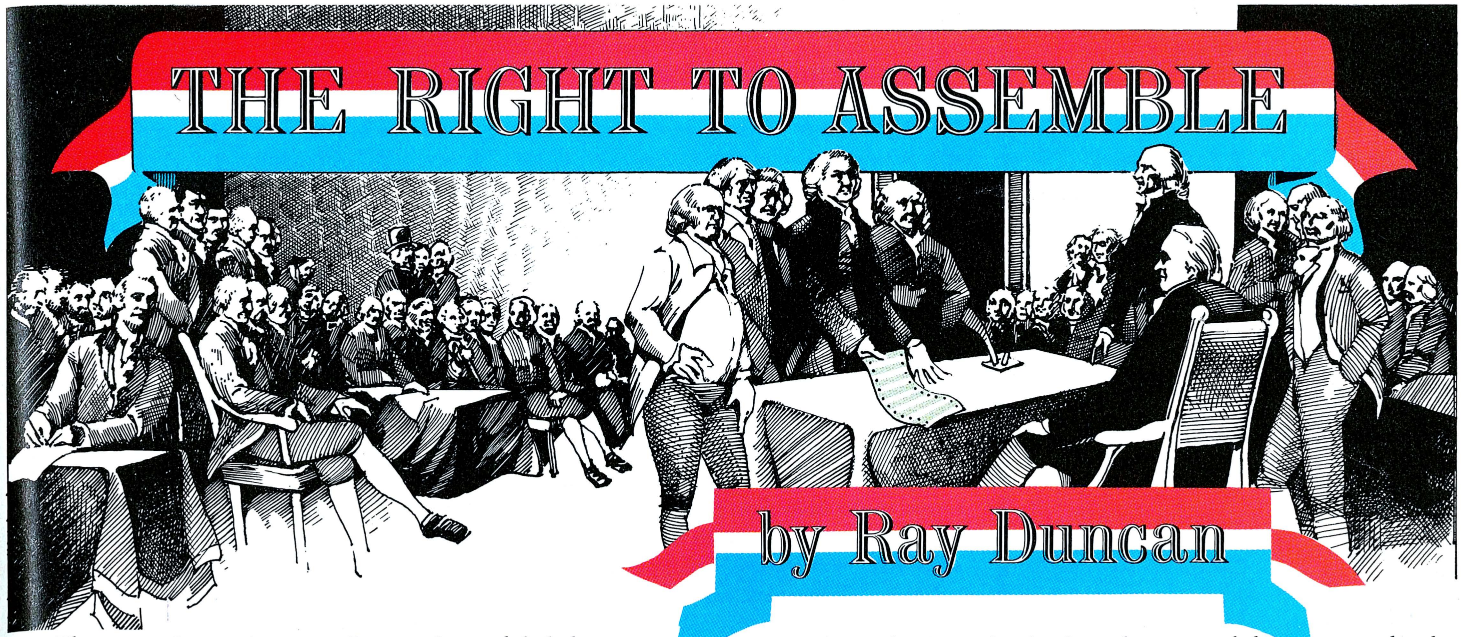
THE RIGHT TO ASSEMBLE

by Ray Duncan



This month's column will introduce some pieces of an assembly language program, review the operation of the Microsoft *Macro Assembler*, and discuss matters of assembly language programming style.

The input to the assembler is called the *source program*, and the file that's created by the assembler is called the *object program*. The source file consists of standard ASCII text, each line terminated by a carriage return-line feed sequence.

Although all the examples in the Microsoft manual use the Edlin line-oriented editor that is supplied with PC-DOS, you can also use almost any of the commonly available screen-oriented editors to write your program. Be careful to set the screen editor's mode so that no unusual control characters or formatting commands are embedded in the text file, as they will often cause the assembler to choke or give an error message. For example, if you're going to use *WordStar*, use it in nondocument mode; if you're using *Volkswriter*, set the right margin with a "/", so that *Volkswriter* doesn't do any right justification or put in end-of-paragraph symbols.

The source program is a mixture of comments, assembly language statements that are translated to executable machine code, and *pseudo-ops* (also known as assembler directives), which are commands that affect the operation of the assembler. Each line of the program consists of up to four fields in the following format:

name operation operand ;comment

The name field is usually optional. The name is made up by the programmer and gives a symbolic identity to a location in the source program. The assembler later associates this symbol with either a numeric value or an actual physical memory address in the object program, depending on whether the labeled statement contains code or data. In the Microsoft assembler, when a name is given to a memory location that contains executable code, it is called a label; applied to a data item, however, it is called a variable-name.

A name may contain any of the characters A through Z, the digits 0 through 9, and the following special characters: ? @ _ . $. There are only three restrictions on the formation of names. The first character cannot be a number; if a period is used, it must be the first character of the name; and only the first thirty-one characters of a name are significant.

The operand field contains a contracted, symbolic term called a *mnemonic*, which must usually match a predefined list built into the assembler. Mnemonics may be either assembler instructions that stand for specific machine instructions and are translated to executable code, or pseudo-ops. Pseudo-ops have diverse actions, such as defining data items, assigning portions of the program to

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different memory segments, controlling the format of the program listing, associating values with names, and defining the limits and attributes of a procedure. The important thing to remember about pseudo-op statements is that they have their effect at assembly time and do not usually result in the generation of executable code for the final program. There's one exception: The powerful pseudo-op called the *macro definition* can be used by the programmer to add new customized instruction mnemonics (temporarily) to the assembler.

The contents of the operand field depend on the type of instruction or pseudo-op found in the operation field. Usually the operand field consists of one or more operands separated by commas; each operand may be a simple or complex expression combining register names, numeric constants, and symbolic values or addresses.

When the operation is one of the microprocessor's arithmetic/logical instructions, the first part of the operand field is called the *destination* and the second part the *source*. For example, the instruction

```
ADD   AX,BX
```

means "add the contents of BX to the contents of AX, leaving the result in register AX." In this case, AX is termed the destination operand, and BX is the source operand.

Unlike some other processors (notably the PDP-11), the 8086 and 8088 won't let you specify memory locations as both the source and destination of a single instruction. So, to move a piece of data from one spot in memory to another, using the 8088, requires two instructions. First you have to load the data from memory into a register, and then, in a separate instruction, you can write the data out to your destination in memory.

The comment field begins with a semicolon and contains free text that is ignored by the assembler. Comments are used to document and explain the assembly code. If the first character in a line is a semicolon, the entire line is treated as a comment; multiple lines of comment text can also be delimited by the COMMENT pseudo-op.

The four parts of an assembly language statement (name, operation, operand, and comment) are separated from each other by at least one blank or tab character. The appearance and readability of your program is vastly improved if names always start in the first character of a line and if tabs are used to align fields vertically. Although the assembler allows your source code lines to be as long as 132 characters, in practice you should keep them much shorter or they will wrap around or be truncated on the program listing.

Using the Microsoft Assembler. The Microsoft *Macro Assembler* distribution disk comes with two versions of the assembler: Asm.com, which omits the macro definition capability and some of the pseudo-ops and requires only 64K of RAM, and Masm.com, which allows macro definitions and requires 96K.

The assembler can be invoked in two ways—either by supplying all the necessary parameters and file names on the command line (this is the more efficient way), or by entering the name of the assembler alone. If you don't enter the parameters on the command line, the assembler will prompt you for them.

When it begins a program translation, the assembler needs to know the following: the name of the file containing the source program, the filename for the object program it's to create, the destination of the program listing, and the filename for the information that will be processed later by the cross-reference utility. The source program filename is the only thing you absolutely must supply; the assembler can provide defaults for the other three parameters (the defaults are usually the same filename as the source file but with different extensions).

In general, the assembler recognizes five file types, which are signified by conventional abbreviations in the extension field of the file specifications, as shown in table 1.

Extension	File's Significance
.ASM	**Assembly language source program. This is the input to the assembler.**
.CRF	**A file created by the assembler that contains information to be processed later by the cross-reference utility.**
.LST	**The program listing created by the assembler. This includes memory locations, machine code, the original program text, and any error messages. This file may be spooled to the printer to produce a hard copy.**
.OBJ	**The machine code output from the assembler, which may be passed through the system linker to create an executable program file.**
.REF	**A printable listing produced by the cross-reference utility from information in the .CRF file.**

Table 1.

Sections 2 and 3 of the *Macro Assembler* manual provide very detailed examples of the operation of the assembler and the cross-

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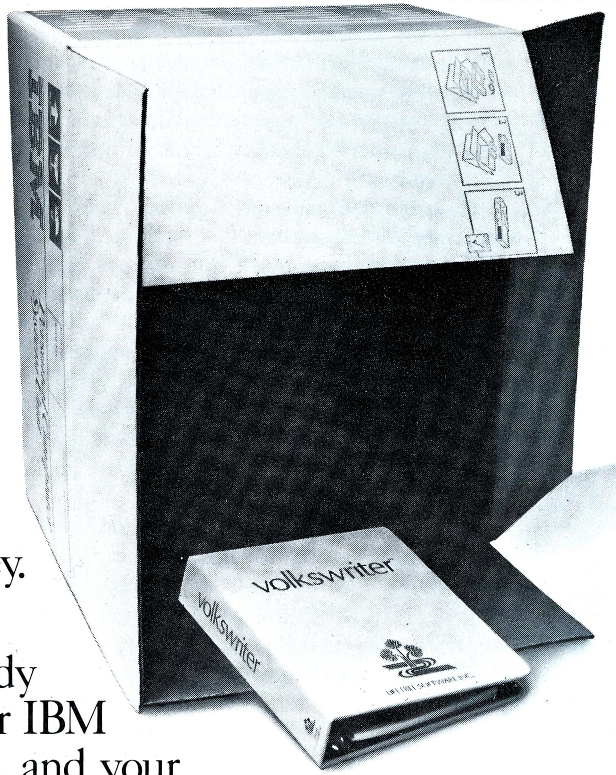

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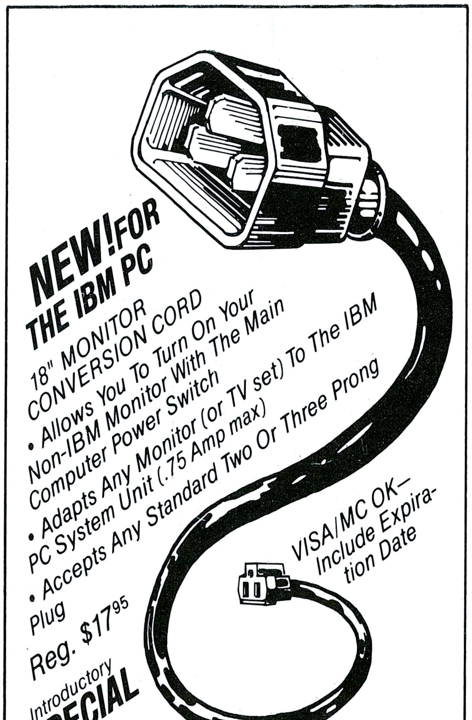
reference utility, so we won't duplicate that information here.

Assembly Language Programming Style. Because assembly language programs are by nature terse, complex, and machine-dependent, you must do everything humanly possible while writing such programs to make them easy to understand and modify later. Programmers commonly find that they comprehend everything about their program perfectly in the heat of creativity, but several months later the programs will have become "cold" and somewhat mysterious. They're apt to be even more mysterious to someone who wasn't involved in the original design. You can reduce such problems by following a number of simple rules.

First specify in the most excruciating detail the intent of the program, the legal input data, the actions to be taken if illegal inputs are detected, and the output or results to be generated by the program. Then write down a very general flow guide for the program. Here's an example of such a general flow guide:

1. **Open data file.**
2. **Read next record.**
3. **If end of file go to 6.**
4. **Print record.**
5. **Go to 2.**
6. **Close file.**
7. **Eject pages from printer and print statistics on terminal.**
8. **Exit to DOS.**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You can rewrite this pseudo-English sketch over and over with increasing detail until every possible input, processing step, and output of the program has been accounted for and described. Then you can attack the coding problem with less fear that problems will crop up and force you to change your design in midstream.

It's considered good practice to make your program as modular as possible. After you finish the specification of your program, isolate as many functions as possible into procedures or subroutines with clearly defined inputs, outputs, and error handling. It's helpful to keep each subroutine short enough to fit on a single page of program listing; this seems to be as large a chunk of code as can be easily assimilated and comprehended as a single entity by someone trying to read your program.

Precede each subroutine with a comment header that spells out the registers or stack positions used for input values, the registers used to return results, and other registers that might be modified or destroyed and/or preserved during the subroutine's execution. Name all nonlocal variables that are references, and describe conditions under which their contents are changed. If you modify a subroutine after the program has once been completed, add a brief note in the comment header giving the date of and reason for the modification. The more information you build into such comment headers, the better, since documentation not included in the program text often gets lost or ignored or becomes out of date.

Add other comments in addition to the subroutine headers. It's an article of faith among assembly language programmers that you can never have too many comments in the code itself. Many companies consider one comment per line of code to be a *minimum*. Of course, the text of the comment needs to provide a meaningful explanation of the code, not just a restatement of the assembly language instruction. One too often sees comments such as

```
ADD BX,AX ;add register AX to BX
```

This is trivial and a waste of printer ribbon. It's much more helpful to write something like this:

```
ADD BX,AX ;add field length to buffer
           pointer
```

When you're commenting a conditional or unconditional jump or call, explain why the jump or call is being taken and what will happen at the other end. This spares readers the distraction of having to flip pages through the program.

Often in the short assembly language routines printed in popular magazines and books, you'll see a hodgepodge of label names, such as

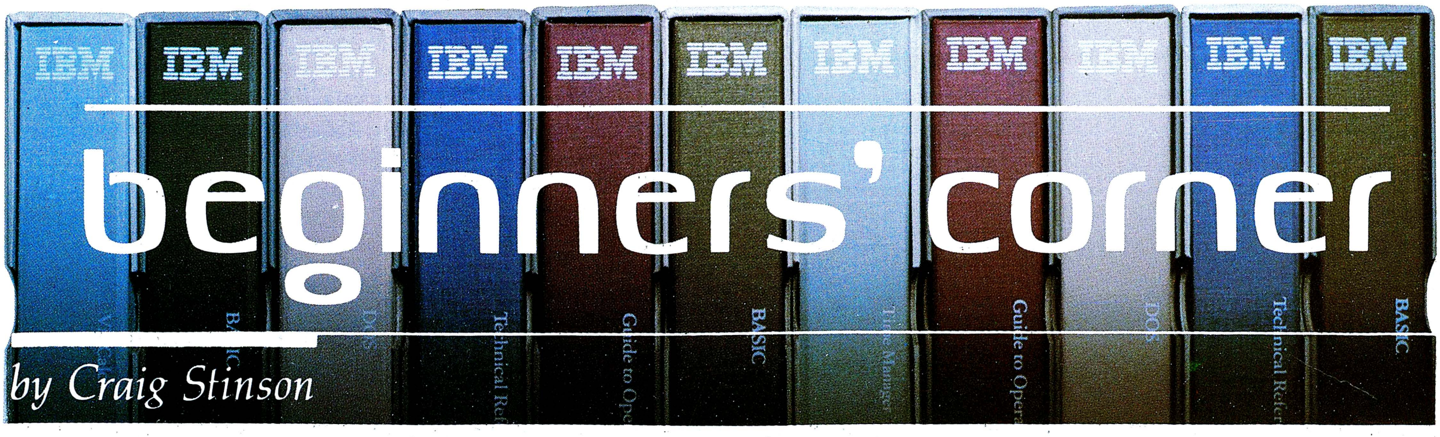
```
start:       push    ax
             .
             .
             .
loop:        .
             .
             .
no_good:     .
             .
             .
next_rec:    .
             .
             .
done:        pop     ax
             ret
```

This is tolerable for short programs but rapidly becomes grotesque and confusing in long assembly language efforts. Such labels carry no implicit positional information, and when you see a statement such as JMP DONE, you have to inspect the pages randomly to find the target label or look it up in the cross-reference listing.

It's a good idea to assign names in a systematic way, adopting a convention that distinguishes executable code labels from variable names. For example, the subsidiary code labels in the subroutine *read* might be assigned (in order) as *read1*, *read2*, *read3*, and so on, while local data variables could be given names like *reada*, *readb*, and *readc*. Other than giving the subroutine as a whole a meaningful name, you can rely on comments, rather than labels, to explain what's going on in your program. This approach prevents many common mishaps, such as collisions in label names and branches to locations that are not executable; it will save you a good deal of time in the debugging process.

Finally, the most important rule in assembly language programming is to keep it simple. Write your code with an eye to making it understandable a year after it's written. Avoid tricks of bit-twiddling. Eschew use of undocumented machine instructions or self-modifying code. Don't employ obscure instruction sequences to try to shave a few machine cycles.

Code that's clean, well organized, and easy to understand is usually fast as well—proving that function may follow form as well as vice versa. ▲



beginners' corner

by Craig Stinson

We left off last month in the middle of a discussion of control characters—their purpose in general and the specific functions commonly associated with certain of them. As you know, the function of any command or character depends upon the context in which it's issued. However, several of the control characters have been more or less universally assigned (by software and hardware developers) particular meanings, and we were in the midst of enumerating this group of quasi-standard codes. We'll finish that discussion this time, and along the way we'll digress to talk a bit about text and binary file types.

Control-M and control-J, you'll recall, usually signify carriage return and line feed respectively. Control-L sends your printer to its next "top-of-form" position, control-I performs horizontal tabs, and control-H is a backspacer.

That top-of-form feature, incidentally, can be a little confusing if you're new to computer printers. Generally what happens is that a printer assumes that it's at the top of a page when you turn it on, and then it keeps count of the number of times it advances a line. Paper comes in standard sixty-six-line forms, so when you send the printer a top-of-form code (or, alternatively, hit the printer's "form feed" button), it rolls the paper until some integral multiple of sixty-six lines has gone by. If you roll the paper manually, of course, the printer no longer knows where it is, and top-of-form codes no longer set you at the top of a page. The easiest remedy for that condition is to take the printer off line, move the paper one line at a time to the top of the next page (using the printer's linefeed button), then shut the power off and turn it back on.

So much for control codes that govern cursor or printhead position. Here are a few other semistandard control character definitions:

Control-C will usually halt a program running under a Basic interpreter. That is, it will halt programs running under most Basic interpreters. It will not however, halt programs running under the IBM Basic interpreter. IBM chose to use control-break (control-scroll lock) instead of control-C; probably they departed from tradition here so that you'd have to use two hands to interrupt a program.

PC-DOS, unlike IBM Basic, does use control-C as a breakout code. It also uses control-break, more or less synonymously with control-C. Either character may be used to abort the execution of a DOS command or a DOS batch file (if you interrupt a batch file, DOS will ask you to confirm the abort by typing Y). There appears to be one difference between control-C and control-break, in terms of their performance in DOS: If your keyboard type-ahead buffer is full (that is, if you've entered as many as fifteen keystrokes for DOS to process as soon as it's done with what it's doing), DOS will not recognize a control-C, but it will respond to a control-break.

Both control-C and control-break cause DOS to print ∧C on your screen. So, oddly, does control-2; but control-2 doesn't have any power to abort. It just puts a ∧C on the screen.

Control-G is a common symbol for beep, or bell. DOS won't do anything impressive with it, but if you type a control-G while

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3. **Confidently.** Walk in to a store and ask to try the **Palantir Word Processor** first. Do look at a couple of others, just so you'll feel good about your choice. [After all, what's important in a word processor is how it feels. You'll spend a lot of time using it. You might as well enjoy using it.]

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you're in Basic, you'll sound the pc chime. Printing chr$(7) in Basic will do the same, as will, in all probability, lprinting chr$(7); most printers will beep when handed a control-G. IBM Basic's beep command does essentially the same thing as the more roundabout print chr$(7).

Control-X, in some contexts on some machines, is a way of cancelling an instruction before the issuance of a carriage return. IBM Basic and PC-DOS use the escape key for that function instead. The backslash character that appears on-screen when you cancel a DOS command by means of the escape key is a fairly standard symbol; systems that use control-X instead of escape for the cancellation of commands generally also signal cancellation by means of a backslash.

Speaking of escape, that's also a control character (its ASCII number is 27). Escape's most common function is to introduce a printer command. Most of the newer printers on the market have very extensive command repertoires to summon all their various font and size options; the majority of these commands consist of the escape character followed by one or more numbers.

Finally, there's control-Z. This character is generally used to signify the end of something—usually the end of a text file. A text file is an assemblage of information encoded by means of ASCII and (most likely) intended to be read eventually as human language. A letter you write in your word processor will be saved on disk as a text file; a program you write in Basic will not (not ordinarily, that is; IBM Basic does give you the option of saving programs as text files, however). Files are saved on disk in units of a definite size (called sectors). Since your file, however, will probably not fill an exact whole number of sectors, your software has to have some way of recognizing where your file does in fact stop, so that it doesn't bring in a lot of gibberish on the tail end of your document. Control-Z is normally used for this purpose.

The fact that control-Z is generally recognized as a termination symbol can be a nuisance in some contexts. There are, for example, terminal programs—designed to facilitate the sending and receiving of information over modems—that quit their transmission activities upon receipt of a control-Z. That's fine if you're sending ordinary text data. Programs, however, and other information not encoded by means of ASCII, may very well contain characters that look to the terminal software like control-Zs, and through misapprehension of these characters' purpose, your terminal software may fail to perform the way you'd like it to.

While we're on the subject of ASCII and text files, let's pause for a moment and consider what kind of information is and isn't likely to be stored by your computer in this manner.

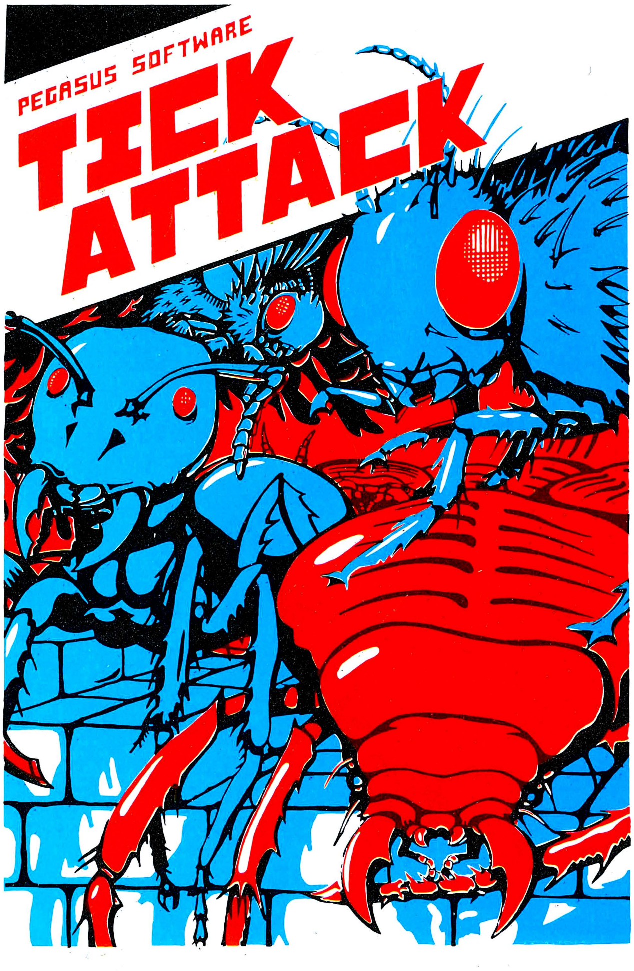
Basic programs, you already know, are not ordinarily stored in ASCII. They're usually stored in what's called a tokenized format. Tokenizing is a way of encoding entire words into single bytes of binary data. Since Basic has a very circumscribed vocabulary, it's possible for the Basic interpreter to encode each legal word in the language with a unique number and store it in a single memory address. That makes for economy on disk as well as in memory; economy in memory translates to speed of program execution, and Basic can use all the help it can get in that regard.

What about data contained within a Basic program? What, for example, if your program contains the statement Print "Enter your name, rank, and serial number"? Those words betweeen the quotes don't fit within the confines of Basic's vocabulary, so they don't get tokenized; they get stored in ASCII instead. So, if you inspect a Basic program by means of a program designed to read ASCII (for example, if you load a program file into your word processor or if you run the DOS type command on a program file), you'll probably see a mixture of unintelligible symbols and plain English.

We're talking here, of course, of programs meant to run under the Basic interpreter. Programs that have been compiled are another story. A compiler (of any language—Basic, Fortran, Pascal, whatever) translates high-level source code into machine level instructions, which are not ASCII. Data contained within such programs, however, may be stored in ASCII, so if you scanned through a compiled program you might still find something intelligible.

Compiled programs and programs written in assembly language are stored in what are sometimes called binary files. That means the files on disk are a bit-for-bit image of something that was once in memory—the file hasn't been translated in any way during its passage from memory to disk. The term binary in this context can be a little confusing. All computer storage—in memory or on disk—is binary. Here the term binary may be understood to mean non-ASCII and nontoken.

Some commercial programs store your data files in a non-ASCII format. This is not the most common practice, but you will run into it from time to time. Lotus Development's *1-2-3* is a good example. Try looking at a *1-2-3* worksheet file by means of the DOS type command and see for yourself. Programs that record your data in this nontypeable fashion probably do so either to conceal some aspect of the program's functioning from you or because they've found some way to compact your data and thereby



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Fortunately such programs usually provide the means of translating your data into a standard ASCII form. *1-2-3*, for example, has a translate function to do just that. That seems only fair; it is your data, after all. It's one thing for a software manufacturer to encrypt program code, but you ought to be able to use your own data in any fashion—and with any program—you choose. It's a good idea to steer clear of software that doesn't give you this freedom.

Meanwhile, back to the control alphabet. There's a table on pages G2–G4 of the IBM Basic manual that sets forth the entire IBM extended ASCII code. You'll notice if you look at that table (or many similar standard ASCII tables) that the control characters have some strange two- and three-character names, like EOT, ETX, and DC4.

Some of these names you may recognize. For example, there's BEL for the character whose ASCII value is 7; if you assign ASCII number 1 to control-A and count forward through the alphabet you'll see that character 7 is control-G, which, as you know, is the standard bell ringer. Similarly you can verify that CR (carriage return, character 13) is control-M, LF (line feed, character 10) is control-J, ESC is character 27, or escape, and so on. What's meant by some of the other symbols is not so obvious.

These cryptic names were established quite a while ago to identify the common functions of the control characters in the context of telecommunications. They're a quaint reminder of the fact that the ASCII code, including its control alphabet, has a long and distinguished history, reaching all the way back into times when computer awareness and literacy were still the private domain of the academically annointed. For the most part they have not found their way into the computer vulgate, although you may encounter them from time to time in manuals for modems or printers.

To the left of these shorthand symbols you'll see some happy faces, card symbols, and other odd characters. These are definitely not artifacts of ancient computer history. They're further extensions of the ASCII code made by IBM for your benefit. Since a number of the control characters have no coding function when sent to the video screen (or to most printers), IBM simply made them available as displayable characters.

If you look further at this ASCII table, you'll see that there's no mention of control-break, control-numlock, control-alt-delete, or any of several other control-key combinations that you may know and love and use regularly. These characters will be among the topics discussed in next month's Beginners' Corner. ▲

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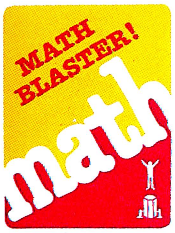

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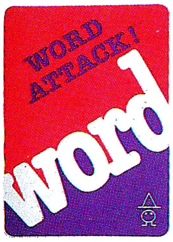

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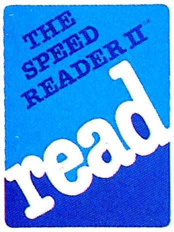

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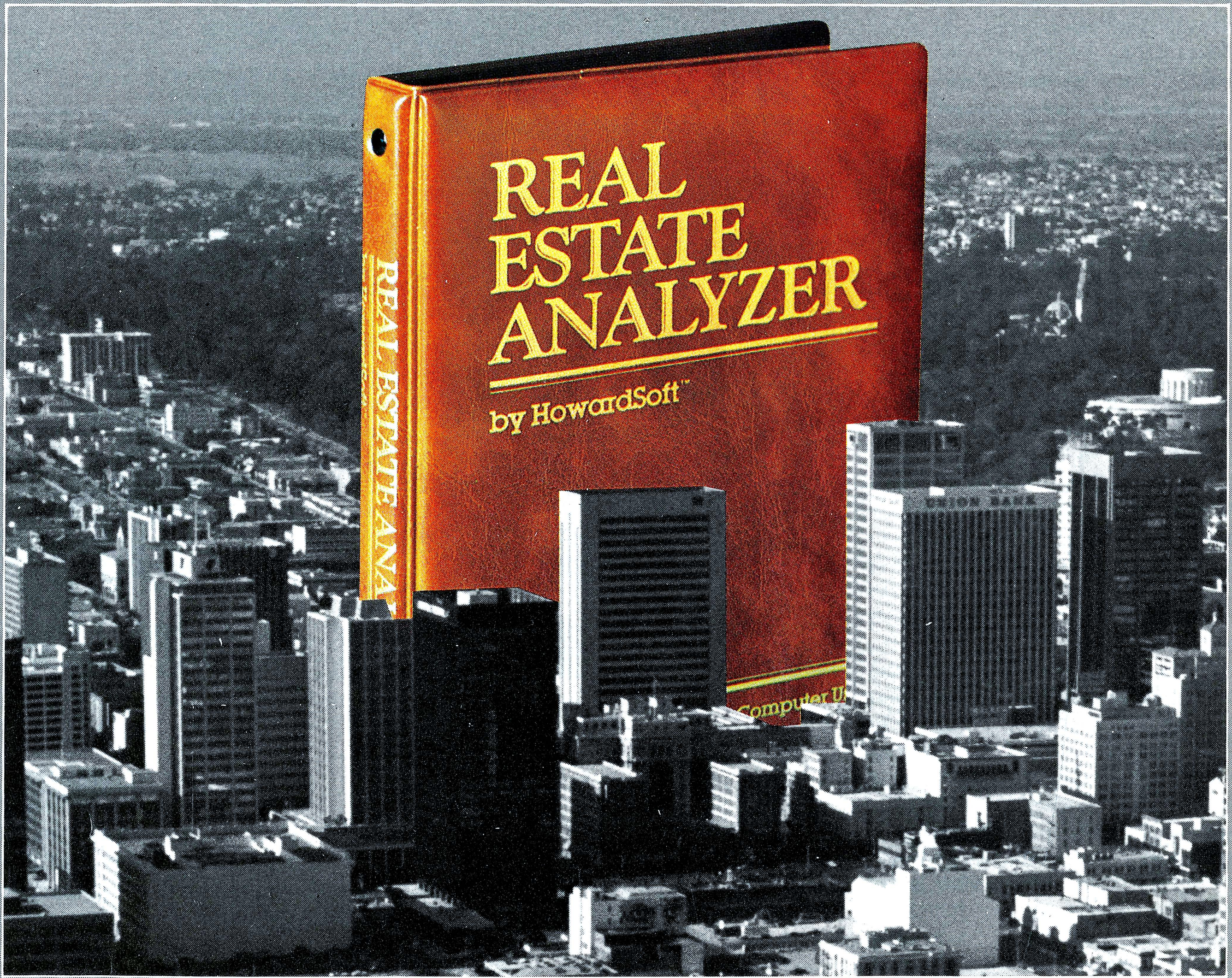

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softalk presents the bestsellers

Very little has changed this month in the IBM Personal Computer software market. So in place of an analysis of month-to-month changes, here are some random reflections on the current bestsellers and their performance over the past year:

Boffo Box-Office Biggie: Lotus Development. In May *1-2-3* outsold the next two bestselling programs combined. *1-2-3* is so strong, Lotus could probably sell it to Timex-Sinclair owners at full price in its original configuration. Words fail even author Mitch Kapor, as you can tell by its title.

Artistic Achievement: *Microsoft Flight Simulator*. Product procurer Alan Boyd wanted this program to make a statement about sixteen-bit software, and has it ever! Best graphics since Walt Disney.

Best Performer in a Starring Role: *WordStar*. First and still the word processing choice of IBM pc users. This program has legs, as well as advanced features that only Mensa members can cope with.

Most Promising Newcomer: *Multiplan*. A comer, even in the face of *1-2-3*'s market blitz. Gives established leader Microsoft two of the four biggest sellers in May.

Best Translation: *dBase II*. If it was good on the Z-80, it's outstanding on the 8088. Kudos to Ashton-Tate for living up to the host computer. A database manager that actually lives up to that description.

Life Begins at Forty (months): *VisiCalc*. Stood atop the pc market for a long time and pulled *VisiFile* and *VisiTrend/VisiPlot* with it. Buffeted by newcomers *1-2-3* and *Multiplan*, the wily veteran lays in wait to make a comeback in concert with *VisiOn*.

Trail Blaiser: *PFS:File*. Currently the bestselling program written in Pascal and a strong competitor in this and other markets. Looks especially strong when pulling companion *PFS:Report* into the limelight.

Home Is Where the Pocketbook Is: *Home Accountant Plus*. Executive-caliber help in the personal finance department. A long-distance runner in what used to be a short-lived market.

Necessity and Motherhood: *Volkswriter*. If you don't like the software available, write your own. Camilo Wilson did, and *Volkswriter*'s a biggie.

If At First You Don't Succeed: *EasyWriter II*. Information Unlimited Software caught the brickbats for *EasyWriter 1*, but the company made that one good as well as introducing a second good one to the market. Greater love hath no company than to yield up both its first and second born.

Lone Stars Can Be Fun: *FriendlyWare*. Texans are supposed to know about oil and longhorns, but the folks at FriendlySoft specialize in fun. *FriendlyWare PC Arcade* is a current hot one and *FriendlyWare PC Intro Set* is a stayer.

It's a YoYo: *TIM III*. Innovative Software's flagship effort bounces around in sales, but superb customer support and timely updates keep this program in the forefront of databases.

It's a Frog: *Frogger*. Lots of pc owners are willing to aid a hapless frog in romance and in crossing roads and rivers.

No, It's IBM: *Asynchronous Communications Support*. How does IBM's baby talk with the rest of the family? With this program, of course. Judging by sales, the pc has lots to say.

Ancient Age: *Typing Tutor*. Around since the dawn of time, or at least the seventh day, this one helps turn managers' clumsy digits into nimble fingers at the keyboard.

Never Say Die: *Word Plus/pc*. Perseverance is a virtue and the folks at Professional Software are mighty virtuous. Program finally getting its due after remarkable market indifference.

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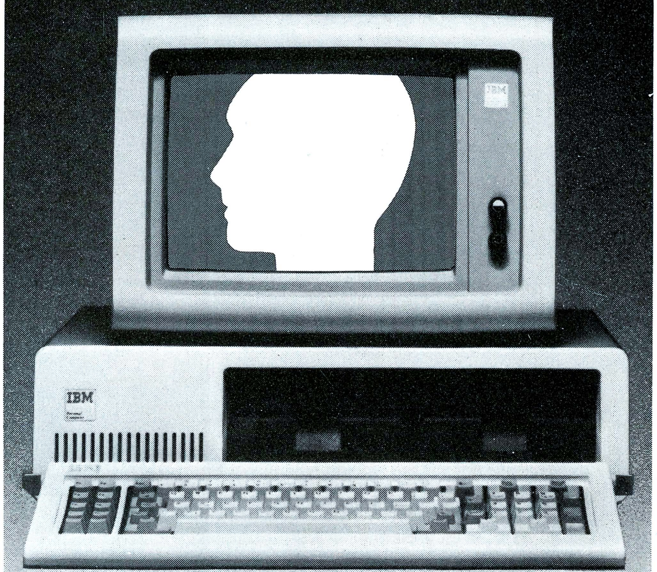

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Talk to the Animals: *Crosstalk*. And when your pc doesn't want to talk within the family, then what? It uses this one to communicate. The pc sprout seems to have a wagging tongue.

Phoenix: *SuperCalc II*. A rebirth of the CP/M bellwether, in new clothes and ready to regain market share. Don't count this one out.

By the Numbers: *BPI General Accounting*. Generally the choice of pc owners. A multifaceted finance tool.

Trials Build Character: *MBA*. First with an integrated package, but nearly eclipsed by *1-2-3*. This one hangs in there and yields sales stubbornly.

Adventurous: *Suspended*. Another Infocom text adventure. The delight of controlling six robots has captured the imagination of pc owners.

Rising Star: *InfoStar*. Lots of pc'ers grabbing onto this stellar database.

Long Shot: *Norton Utilities*. Major-league sales from a cottage company.

Big Blue's Finest: *Macro Assembler* and *Personal Editor*. *Macro Assembler*'s been around for a while, doing yeoman duty. *Personal Editor* is just catching on. ▲

the top thirty

This Month	Last Month	Index	
1.	1.	246.38	**1-2-3,** Mitch Kapor and Jonathan Sachs; Lotus Development
2.	2.	98.32	**Microsoft Flight Simulator,** Bruce Artwick; SubLogic
3.	3.	90.12	**WordStar;** MicroPro
4.	5.	76.66	**Multiplan,** Microsoft; IBM
5.	4.	43.31	**dBase II,** Wayne Ratcliff; Ashton-Tate
6.	6.	37.45	**VisiCalc,** Software Arts/Dan Bricklin and Robert Frankston; VisiCorp, IBM
7.	15.	35.11	**PFS:File,** John Page and D. D. Roberts; Software Publishing Corporation
8.	7.	32.77	**Home Accountant Plus,** Mike Farmer, Bob Schoenburg, Larry Grodin, and Steve Pollack; Continental Software
9.	9.	28.68	**Volkswriter,** Camilo Wilson; Lifetree
10.	13.	27.51	**EasyWriter II,** Basic Software Group; Information Unlimited Software
11.	12.	24.58	**FriendlyWare P.C. Arcade,** Michael D. Yaw, James J. Davis, Alan Vanchura, Jr., R. B. Roberts, and Anthony Chumak; FriendlySoft
12.	29.	21.07	**TIM III;** Innovative Software
13.	29.	19.90	**Frogger,** Olaf Lubeck; Sierra On-Line
14.	21.	19.31	**FriendlyWare P.C. Introductory Set,** Michael D. Yaw, James J. Davis, Frank Smith, Alan Vanchura, John Leatherwood, and Bruce W. Moore; FriendlySoft
15.	19.	18.14	**Asynchronous Communications Support 2.0;** IBM
	—	18.14	**Typing Tutor,** Michael Sierchio (Dick Ainsworth and Al Baker); IBM (Microsoft)
17.	—	17.56	**PFS:Report,** John Page; Software Publishing Corporation
18.	27.	16.97	**Word Plus-PC,** Andres Escallon; Professional Software
	13.	16.97	**PC Tutor,** Lora Meise and Rick Lane; Comprehensive Software Support
20.	16.	15.80	**The Instructor,** Jo-L Hendrickson; Individual Software
21.	8.	14.05	**Crosstalk;** Microstuf
	25.	14.05	**SuperCalc II;** Sorcim
	—	14.05	**General Accounting,** John Moss and Ken Debower; IBM (BPI)
24.	11.	13.46	**Cdex Training for VisiCalc,** Dr. Stephen C. Brandt; Cdex
25.	—	12.87	**MBA;** Context Management Systems
	—	12.87	**Macro Assembler,** Microsoft; IBM
27.	18.	12.29	**Suspended,** Infocom
	27.	12.29	**InfoStar;** MicroPro
	—	12.29	**Norton Utilities,** Peter Norton; Peter Norton Inc.
30.	—	11.70	**Personal Editor;** IBM

IBM-franchised retail stores representing approximately 5.85 percent of all sales of IBM and IBM-related products volunteered to participate in the poll.

Respondents were contacted early in June to ascertain their sales for the month of May.

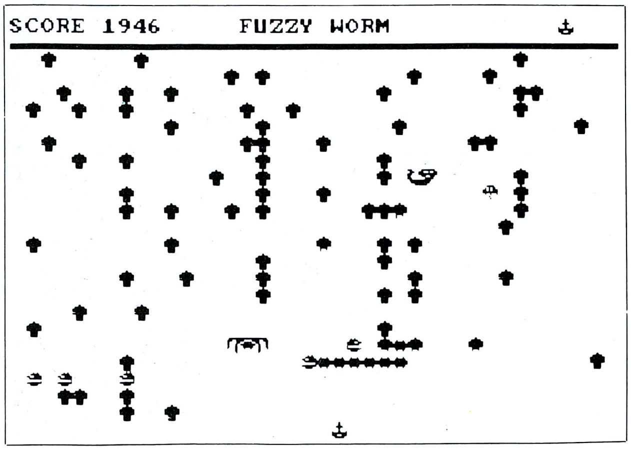
The only criterion for inclusion on the list was the number of units sold; such other criteria as quality of product, profitability to the computer store, and personal preference of the individual respondents were not considered.

Respondents in June represented every geographical area of the continental United States.

Results of the responses were tabulated using a formula that resulted in the index number to the left of the program name in the Top Thirty listing. The index number is an arbitrary measure of relative strength of the programs listed. Index numbers are correlative only to the month in which they are printed; readers cannot assume that an index rating of 50 in one month represents equivalent sales to an index number of 50 in another month.

Probability of statistical error is plus or minus 4.36 percent, which translates roughly into the theoretical possibility of a change of 4.71 points, plus or minus, in any index number.

FUZZY WORM $29.95



FUZZY WORM is an absolute must for everyone who enjoys fast action arcade games. The object of the game is to destroy all of the FUZZY WORMS while avoiding the DROPPERS and the deadly SPIDER. Bonus points can be earned by shooting the FIREBALLS which occasionally make their way onto the screen.

The game is loaded with features
- Extra SHOOTERS are awarded for high scores
- The sounds are fantastic and can be turned ON OFF during the game
- The TOP 10 scores are saved on the disk
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- Requires an IBM-PC with at least 64K memory and 1 disk drive

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